The Province of Alberta

IN THE MATTER OF THE PUBLIC INQUIRIES ACT

—and—

IN THE MATTER OF a Commission, dated the 12th day of October, A.D. 1938, to inquire into matters connected with Petroleum and Petroleum Products

Commissioners:

The Honourable MR. JUSTICE McGILLIVRAY
(*Chairman*)

—and—

L. R. LIPSETT, ESQ.

Session:

CALGARY, Alberta OCTOBER 12th, 1938

VOLUME 1

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I N D E X Cont'd.

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"15" - Dr. Ia.

"16" - Product. Short, [illegible]

"17" - Product, [illegible]

"18" - Twelve [illegible]

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IN THE MATTER OF THE PUBLIC
INQUIRIES ACT,

-and-

IN THE MATTER OF A COMMISSION
dated the 12th day of October,
A.D. 1938, to inquire into the
matters contained therein.

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The Sittings of the Commission opened at the Court House in the City of Calgary, in the Province of Alberta, at 10.30 A.M., Monday, October 17th, 1938, The Honourable Mr. Justice McGillivray and Lewis Richard Lipsett, Esq., presiding.

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PRESENT:

V .R. Jones, Esq.,	Clerk of the Court, Calgary, Alberta
J.J. Frawley, Esq.,K.C., -and- F.G.Cottle Esq., C.A.,	For the Commission.
A.L. Smith, Esq., K.C.,	Appeared on behalf of the Alberta Producers Association
H.G. Nolan, Esq., K.C.,	Appeared for the Imperial Oil Limited, The North-West Company Limited, The Royalite Oil Company Limited, The Dalhousie Oil Company Limited, The Foothills Oil& Gas Company Limited, The South West Petroleum Company Limited, The Ethyl Gasoline Corporation and The Deep Oils Limited and Crude Oils Limited.
Eric L. Harvie, Esq.,	For the British American Oil Company Limited.
James C. Mahaffy, Esq.,	For the Great West Distributors Ltd.
H. E. Cutler, Esq.,	Sworn as Special Commission Reporter.

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(Mr. V. R. Jones here reads commission).

- C O M M I S S I O N -

"J. C. Bowen"

Lieutenant-Governor.

GEORGE THE SIXTH, by the Grace of God, of Great Britain, Ireland, and the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India.

To all to Whom these presents shall come, or Whom the same may in any wise concern.

GREETING----------

WHEREAS at the Sixth Session of the Eighth Legislative Assembly of the Province of Alberta it was resolved that in the opinion of the said Assembly the Government should be requested to give consideration to taking over the wholesale and retail distribution of petroleum products in the Province and/or to undertake a thorough inquiry into the spread between the field price of crude oil and the wholesale and retail prices of refined petroleum products with a view to bringing about a reduction in the consumer price of the said products: and

WHEREAS under the provisions of The Public Inquiries Act, being Chapter 26 of the Revised Statutes of Alberta, the Lieutenant Governor in Council may whenever he deems it expedient and in the public interest to cause an inquiry to be made into and concerning any matter within the jurisdiction of the Legislative Assembly, either connected with the good government of the Province or the conduct of the public business thereof or which he shall by his commission declare to be a matter of public concern, appoint a Commissioner or Commissioners to make such

inquiry and to report thereon; and

WHEREAS it is expedient and in the public interest to cause inquiry to be made pursuant to The Public Inquiries Act into and concerning the matters hereinafter mentioned;

NOW KNOW YE that by and with the advice of Our Lieutenant Governor in Council we do by these presents nominate, constitute and appoint the Honourable Alexander Andrew McGillivray, a Justice of the Supreme Court of Alberta Appellate Division, and Lewis Richard Lipsett of Ardley, in the Province of Alberta, the said the Honourable Alexander Andrew McGillivray to be Chairman of such Commissioners, to make inquiry into the matters hereinafter mentioned and to report thereon to the Lieutenant Governor in Council:

1. Declaring the matters hereinafter mentioned, being matters within the jurisdiction of the Legislative Assembly, to be matters of public concern, namely:-

   (1) The production, refining, transportation and marketing of petroleum and petroleum products in the Province of Alberta, the cost and price thereof, and without derogating from the generality of the foregoing, the following matters:

   (a) The field price of crude petroleum in the Province of Alberta, the factors which enter into the determination of the said price, and the fair and equitable field price which should be paid for crude petroleum in the Province of Alberta.

   (b) The cost of importing crude petroleum and refined petroleum products into Alberta and the laid down cost of the said crude petroleum and refined products.

(c) The cost of refining and processing crude petroleum in the said Province and particularly the adequacy and efficiency of present refineries and the reasonableness or otherwise of depreciation and other charges included in existing refining costs, and what the fair and equitable cost of refining and processing crude petroleum in the said Province should be.

(d) The cost of gathering, handling, and transporting in Alberta of crude petroleum and of refined petroleum products and without limiting the generality of the foregoing.

(1) the rates charged for the gathering, handling, and transporting of crude petroleum by pipe-line or otherwise from Turner Valley to Calgary in the said Province, and what the fair and equitable rates for such gathering handling and transporting should be.

(11) the adequacy and efficiency of present pipe-line facilities, and

(111) whether existing pipe-line facilities result in or tend toward an unwarranted control of the price of either crude petroleum or refined petroleum products.

(e) The cost of distributing and marketing petroleum products in the Province of Alberta, (a) by wholesale to jobbers, dealers and consumers, and (b) by retail, and without limiting the generality of the foregoing:

(1) the factors which enter into the determination of the said cost,

(11) the following matter, namely: whether any plant, equipment or other investment of any kind now used in the distribution and marketing of petroleum products in the said Province, whether by wholesale

or by retail is or is not in the opinion of the said Commission reasonably required for the purpose of adequately distributing and marketing petroleum products in the said Province, and should or should not in his opinion be taken into account in arriving at fair and equitable prices to be charged by wholesale or by retail for petroleum products in the Province.

(111) What the fair and equitable cost of distributing and marketing petroleum products in the Province of Alberta should be.

(f) The operation of the Ethyl Corporation in this Province and the effect of the Licensing system of the said Corporation upon the refining, distributing and marketing of petroleum products in the said Province.

(g) The Price and/or cost of petroleum products sold to jobbers and dealers in the said Province and the factors which enter into the determination of the said price and/or cost and what the fair and equitable price and/or cost of petroleum products sold to jobbers and dealers in the said Province should be.

(h) The price and/or cost of petroleum products sold to consumers in the said Province and the factors which enter into the determination of the said price, and what the fair and equitable price and/or cost of petroleum products sold to consumers in the said Province should be.

(i) The profits of persons, firms or corporations engaged in the importation of crude petroleum and petroleum products into the Province of Alberta or in the refining, producing

and supplying either by wholsale or retail of crude petroleum or petroleum products in the said Province and the reasonableness or otherwise of the said profits.

(j) The factors which ought properly to be taken into account in fixing the price of crude petroleum and any refined petroleum product.

(k) The fair and equitable price, maximum and/or minimum, which should be charged by wholesale and by retail for refined petroleum products in the Province of Alberta.

(l) (1) Whether any charges of any description made in respect of the production processing, handling, gathering or distribution of crude petroleum and refined petroleum products or any of them is excessive or unreasonable having regard to the matter or thing for which the charge is made.

(m) Whether any expenditure is incurred in or incidentally to the production, processing, handling, gathering or distribution of crude petroleum and refined petroleum products or any of them which is not essential or is not in the public interest.

(n) The advantages and/or disadvantages to the people of the Province in the Government of the Province taking over the wholesale and retail distribution of petroleum products in the Province

(o) Such further matters as the Commission may consider properly and reasonably incidental to any of the foregoing matters of inquiry:

AND WE DO DECLARE the matters referred to Our said Commissioners to be matters of public concern, and under authority of the Act aforesaid, confer upon Our said Commissioners the power of summoning witnesses before them and requiring such witnesses to give evidence on oath, orally or in writing, or on solemn affirmation (if they are persons entitled to affirm in civil matters) and to produce such documents and things as the said Commissioners may deem requisite to the full investigation of the matters with which they are appointed to inquire.

IN WITNESS WHEREOF We have caused these Our Letters to be made Patent and the Seal of Our Province of Alberta to be hereunto affixed.

WITNESS: His Honour the Honourable John Campbell Bowen, Lieutenant Governor of Our said Province in Our City of Edmonton, this Twelfth day of October, in the year of Our Lord, one thousand nine hundred and thirty-eight and in the SECOND year of His Majesty's Reign.

B Y C O M M A N D :

"Ernest C. Manning"
Provincial Secretary.

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THE CHAIRMAN: The Commission observes that it will have the assistance of Counsel. We would be glad, Gentlemen, if you will tell us whom you respectively represent.

MR. FRAWLEY: I am appearing, my Lord, as Counsel for the Commission and there is associated with me F. G. Cottle, C. A., in an accounting and advisory capacity.

MR. SMITH: I am appearing for the Alberta Producers Association.

MR. NOLAN: I appear, my Lord, for the Imperial Oil Limited, The North West Company Limited, The Royalite Oil Company Limited, The Dalhousie Company Limited, The Foothills Oils and Gas Company Limited, South West Petroleum Company Limited, the Ethyl Gasoline Corporation and for Deep Oils Limited and Crude Oils Limited.

MR. HARVIE: I appear, my Lord, for the British American Oil Company Limited.

MR. MAHAFFY: I appear, my Lord, for the Great West Distributors.

THE CHAIRMAN: Mr. Frawley?

MR. FRAWLEY: I just wonder if there are any other people who are not represented by Counsel but with respect to whom it might be a good idea to get them on the record. It is possible they may be appearing from time to time to make representations.

THE CHAIRMAN: Anyone else here present who appears in person or for their respective companies other than by their Counsel.

(No reply).

MR. FRAWLEY: I propose this morning, my Lord, to give a kind of outline of the scope of the work as I see it which lies ahead of the Commission. I first would like to say that the notice of this Sittings of this Commission appeared in four Alberta newspapers. I will submit proof of the advertisement in due course. At the moment I may say that my instructions are, and I have every reason to believe they were carried out, that the notice giving this time and place as the first meeting of the Commission appeared in the Edmonton Bulletin on the 11th and 14th days of October, in the Edmonton Journal on the 11th and 14th days of October, in the Calgary Albertan on the 12th and 14th days of October, and in the Calgary Herald on the 11th and 14th of October.

Mr. Chairman, this Commission arose out of a resolution passed at the last Session of the Alberta Legislature. The full resolution reads as follows, as appears at Page 125 of the Journals of the Sixth Session of the Eighth Legislatibe Assembly.

"Moved by Mrs. Rogers, seconded by Mr. Hartley:
"Whereas the Dominion Tariff Board in making its
"report to the Minister of Finance in May, 1935,
"after an investigation of several months into the
"petroleum industry throughtout Canada, stated in
"terms that there appeared to be no justification
"for the price of gasoline in Calgary, pointing
"out that such gasoline was manufactured from
"Montana crude together with a substantial portion
"of Turner Valley naptha, while since the date of
"the said Tariff Board Report there has been dis-
"covered in the Turner Valley a major oil field

"with a daily potential capcaity of 33,000 barrels,
"with the result that with minor exceptions all
"the and distillate consumed in the
"Province is now manufactured wholly from crude oil
"produced in the Province, and furthermore, due to
"the Western Canadian market being unable to consume
"the total production of crude oil, the refineries
"have found it necessary to curtail their purchases
"to 42% of the total daily production; and

"Whereas the wholesale price of standard gasoline
in the City of Calgary today is 16.5 cents per gallon,
"exclusive of Provincial Fuel Oil Tax, while the
"present field price of Turner Valley crude oil,
gravity 46 degrees, wich is the average gravity of
"refinery run, is $1.26 per barrel, or three and one-
"third cents per gallon; and

"Whereas with the exception of one reduction of one
"cent per gallon throughout the Province, and a further
"reduction of one cent per gallon in the City of
"Calgary, and 1.2 cents per gallon in the City of
"Edmonton, all reductions in the price of gasoline
"and distillate since May 1935, had been brought
"about by imposing upon producers reductions in
"the field price of crude oil, in other words,
"without any appreciable reduction in the spread
"between the field price of crude oil and the whole-
"sale price of refined products; And

"Whereas it is universally admitted that there is

"excessive duplication and consequent excessive "cost in the distribution of petroleum products, "both wholesale and retail, undoubtedly adding to "and maintaining the unreasonably large spread "between the price paid for crude oil and the price "which the public has to pay for refined products, "but at the same time there appears to be no attempt whatever on the part of those engaged in "the distribution of petroleum products to bring "about any economy in distribution methods, whole-"sale or retail, and it is obviously expedient and "in the public interest that the present state of affairs should not be allowed to continue:

"THEREFORE BE IT RESOLVED that in the opinion of "this Assembly the Government should be requested "to give consideration to taking over the wholesale "and retail distribution of petroleum products in "the Province and/or to undertake a thorough inquiry "into the spread between the field price of crude "oil and the wholesale and retail prices of refined "petroleum products with a view to bringing about a "reduction in the consumer price of the said products.

"A debate followed. The motion being proposed Mr. "Speaker declared the motion carried unanimously".

THE CHAIRMAN: Where is that resolution to be found?

MR. FRAWLEY: That resolution is to be found, it was adopted, my Lord, on the 24th of March, 1938, and it is to be found at Pages 125 and 126 of the Journals of the Sixth Session of theEighth Legislative Assembly,

that is the last Volume, 1938, that is the last Session of the Legislature.

Now before embarking upon any comments or outline of what I conceive to be the scope of the Inquiry, might I give to the Commission two figures on the gross crude production in the Province of Alberta. In 1936 the records of the Department of Lands and Mines show that there were produced 1,287,238 barrels of crude oil of a value of $2,882,990.00. In 1937 that production was increased and I have those figures in somewhat more detail, and I think it would be worth while to put on the record what the production was according to certain groupings or classification. The crude oil production was as follows:-

From the Imperial Oil Company group 706,473 barrels, divided as follows:- Advance 5A, 17,082; Davies Number 2 156,714; Royal Canadian 10,509; Sterling Pacific 3, 4, 5, and 6, 522,168, or a total as I have said of 706,473 barrels of a value, of an estimated value of, $1,123,466.35.

From the Brown Oil Corporation group:

B.&B. No. 1, 199,534; Brown 1 and 2, 66,091; Four Star 1, 21,514; Royal Crest 1, 16,040; Three Point 1, 10,854; Turner Valley Royalties 1 244,617; and West Side 1, 84,982, or a total produced from that group of 643,632 barrels of an estimated value of $1,082,435.97.

From the Anglo-Canadian Development and Holding group; Firestone 1, 18,614; Foundation 1, 100,457; Monarch 1, 71,578; Prairie 1, 54,678; Westflank 1 and 3, 6,804, or a total from that group of 252,131 barrels of an estimate value of $406,826.87.

From miscellanious wells as follows:-

Commoil Limited, 34,881; Granville Oils Limited,

14,325; Model Oils Limited 56,439; Model-Spooner Syndicate 36,740; National Petroleum Corporation Limited 27,312; Share Royalties Limited 25,894; Sunset Oils Limited, 7,029, or a total from that group, from all those oil wells of 1,894,856 barrels with a value of $2,916,248.09.

That was the production of crude oil from what has been classified as "Oil wells", that is those wells having a gas-oil ratio of 31,000 cubic feet, or better, that is those wells which require 31,000 cubic feet of gas or less to raise one barrel of oil to the surface. Those have been classified as "oil wells" and the figures I have given the Commission up to now show the production of crude oil from those kind of wells, namely, Oil wells.

From gas wells there was produced, of crude oil, 111,254 barrels with a value of $210,575.26.
From shallow wells, that is those wells that produce not from the Madison limestone but from the McDougal-Segur sands 10,589 barrels of a value of $18,551.45.

There was, therefore, a total crude oil production of 1,926,699 barrels of a value of $3,145,374.80.

Of separator naptha 183,353 barrels with a value of $432,713.08.

Of absorption plant naphtha 657,169 barrels with a value of $1,494,240.84.

There was a total oil production therefore, from the Turner Valley field of 2,767,221 barrels with a total estimate value of $5,072,328.72.

Then there were crude imports in the year 1928, no, what I gave to the Commission were the figures of crude oil production with value for the year 1937. I would now

like to give you the refinery throughput of Turner Valley products for the year 1938. The total, I can give you the particulars, well I can give you as a matter of fact, I can give you the totals by months of the Turner Valley production, which is the first figure I would like to give you, because it relates itself to the figures which I have just concluded giving you for 1937. The total Turner Valley production for January, 1938, in barrels, 440,974; for February 397,815; For March 464,066; For April 443,183; for May 541,800; for June 517,504; for July 672,010; for August 792,880, that was the total Turner Valley production.

Now what was refined in Alberta in the year 1938 reads as follows:

In the month of January, Imperial, Calgary, put through 91,351 barrels. The British American 80,966; Gas & Oil Products 12,035; Lion Refinery of Calgary 1,559 and Becker refinery at Turner Valley 5,318. That was the Refinery throughput for the month of January 1938.

For the month of February 1938, the Imperial 111,261, the British American 83,081, the Gas & Oil Products 8,322, Lion Refinery 1,154, and the Becker Refinery 570.

In the month of March the Imperial 77,028, the British American 140,070, the Gas & Oil Products 9,215, and Lion 2,779, the Becker 3,943, the Monarch 500 a small refinery, and the Gold Standard at Wainwright 636.

In April the Imperial 103,226, the British American at Calgary 105,944, the Gas & Oil Products 12,665, the Lion Refinery 8,990, the Becker Refinery 12,541, the Monarch 1,372, the Gold Standard at Wainwright 1409,

and the Okotoks Refinery 284 barrels.

In the month of May the Imperial at Calgary 79,263, the British American 123,597, the Gas & Oil Products 34,992, the Lion Refinery 22,788, the Becker Refinery 12,535, the Monarch 341, the Gold Standard 921, the Okotoks 283, and the Hydro Pete, a small refinery at Red Deer, 154 barrels.

In June the Imperial 154,094 barrels, the British American 92,599, the Gas & Oil Products 33,722, the Lion 9,658, the Becker Refinery 17,211, the Gold Standard,1,013, the Okotoks Company 205, the Hydro Pete 1059, and Meikljohn & Agnew at Wainwright 382.

In the month of July the Imperial at Calgary 233,391, the British American 112,102, the Gas & Oil Products 35,038, the Lion Refinery 8,350, the Becker Refinery 13,100, the Gold Standard 1198, the Okotoks 195, and the Hydro Pete 512.

In the month of August, which concludes all the figures I have for 1938, the Imperial at Calgary 258,545, the British American at Calgary 32,766, the Gas & Oil Products 38,412, the Lion 10,001, the Becker Refinery 16,305, the Monarch 290 , the Gold Standard 1108, the Okotoks 95 barrels, and the Hydro Pete 900 barrels.

Those are totalled, the total of Alberta Refinery throughput at Turner Valley, of course all this statement is the Refinery throughput, I mean what was put through the Refinery, various Alberta refineries, in the year 1938, by months up to and including August.

The total for the month of January 191,229, in the month of February 204,388, March 234,171, April 246,431, May 274,874, June 309,943, July 403,886 and in August 358,422.

Now that was what was put through Alberta refineries of Turner Valley crude, but there was imported into Alberta in 1938 the following amount of crude, these figures are taken from the returns made by the importers to the Department of the Provincial Secretary with respect to the Fuel Oil Tax Branch of the Department:

In the month of January the British American Refinery at Coutts imported 2,298 barrels, in February 1751 barrels, none in March, in April 3,329, in May 2,383, in June 33,619, in July 22,454, and in August 23,103.

The Hydro Pete Refinery at Red Deer imported in June 213 barrels, in July 1,144 barrels and in August 268 barrels.

There is shown as being imported by the Tax Collector at Aden, which simply means, Sir, that these are miscellaneous importations which passed through the Tax Collector at Aden on the Montana border, in April 255 barrels, in May 498, in June 615, in July 504, and in August 298.

There passed through the Tax Collector at Coutts in May 886 barrels, in June 980, in July 500, and in August 532. Those are all barrels.

The Huff Refining Company at Lethbridge imported in March 19 barrels, in May 876, in June 2,532, in July 1,202 and in August 1,832.

The Imperial Refinery at Calgary imported in June 15,112 barrels.

The total imported into Alberta of crude oil from Montana, I think one might say exclusively from Montana, in January 2,298 barrels, in February 1,751, in March 19, in April 3,584, in May 4,643, in June 53,071, in July

25,804, and in August 26,033.

Now I have no comments to make on that at the moment except to say that the resson for those importations will be disclosed in evidence before the Commission. The chief importations, as your Lordship will see, was the British American at Coutts, which had a fairly steady importation beginning in January and running through until the end of this table in August. The British American have been operating their refinery in Coutts in a small way and the importations which I have shown are the importations which went to that refinery during that period. Now that is.....

THE CHAIRMAN: Now Mr. Frawley, I suppose in due course these compilations which you have read into the record will be verified and made an exhibit?

MR. FRAWLEY: Yes, my Lord.

THE CHAIRMAN: They would be part of the proceedings.

MR. SMITH: And I take it we might have copies at some time?

MR. FRAWLEY: Oh yes.

THE CHAIRMAN: They will be part of the proceedings.

MR. FRAWLEY: Now passing from crude consumption in this Province, our crude consumption, I want to pass down to the consumption of refined products. The Dominion Bureau of Ststistics publish every year, and more frequently than that, the retail sales of gasoline in Alberta and I have taken from their figures the following totals: In the year 1937, this is the record of the retail sales of gasoline in Canada, in the Province of Ontario, 324,859,000 gallons, in the Province of Quebec 128,395,000; the next Province is Alberta 75,186,000 gallons. Now a note there, a perfectly

correct note, in the Dominion figures, which is the figure which I have just read, 79,166,000, there is included Deisel Oil, which is not included in the other Provinces, and includes 9,430,126 gallons of heavy oil and kerosene. Perhaps I might state and explain that, the reason that appears is this, in the Province of Alberta the Fuel Oil Tax or the Gasoline Tax is imposed on every product which is capable of generating power in internal combustion engines. In the other Provinces the taxable thing is defined differently and it is, generally speaking, only gasoline in the other Provinces, and perhaps distillate,- but our tax goes on all of the heavier fuels, and that explains why we have seventy-five million odd. In any event we stood in third place, because British Columbia, which is next, had a gasoline consumption of 54,755,000; Saskatchewan next with 46,278,000; Manitoba 34,636,000; Nova Scotia 29,144,000; New Brunswick 21,947,000 and Prince Edward Island 3,420,000.

In 1938, the figures are available from January to June inclusive, and I will give them.

In Ontario 146,149,000; in Quebec 53,178,000; on our own Province of Alberta 32,101,000; in British Columbia 25,478,000; in Saskatchewan 29,990,000; in Manitoba 14,514,000; in Nova Scotia 11,642,000; in New Brunswick 8,177,000 and in Prince Edward Island 1,141,000.

Then the figures taken and prepared by the Department of the Provincial Secretary, Fuel Oil Tax Branch, which is the gallonage which is reported by the vendors of gasoline to that Department, for 19[illegible] there were sold 65,880,009

gallons, and in 1938 for the first six months 32,539,224 gallons.

So one needs only to look at these figures to realize the importance of the petroleum industry in the Province of Alberta. We stand third in gasoline consumption.

Now, coming to the particular subjects with respect to which this Commission is expected to inquire and to report to the Lieutenant Governor in Council. I have made a number of classifications of inquiry and I have found that in doing that I have had to rearrange and regroup the headings of the Inquiry as they appear in your Commission, and the first subject, particular subject of inquiry would appear to be the field price of crude, and that appears in Paragraphs (a), (j/, (l), (m) and (i) of the Commission.

"(a) The field price of crude petroleum in the Province of Alberta, the factors which enter into the determination of the said price, and the fair and equitable field price which should be paid for crude petroleum in the Province of Alberta."

The other paragraphs are simply collateral to that first paragraph.

Now the field price of crude oil in Turner Valley is,- the price is posted as being f.o. b. field tankage,- and the existing price, the price range which is being paid today was posted on the 5th of January, 1938, and the National Petroleum News of the 5th of October, 1938, indicates that that price was posted by the Imperial Oil Company,- the present average,- to discuss this posted

price, the price that is posted runs from $1.14 a barrel for crude oil with a gravity of 40 to 40.9 degrees, A.P.I., American Petroleum Institute, it runs from that price, to $1.62 for crude oil for 64 to 64.9 degrees. At the present time my information is that perhaps I should say first before I leave that, that there is a Jump between each figure of two cents, for example, the beginning price of $1.14 is for 40 to 40.9 degrees. The next price is $1.16 for 41 to 41.9, and then $1.18 for 42 to 42.9, and so it goes. I am told that the average refinery run is now 43.4, so that consulting this posted price we find that what is now being paid in Turner Valley on the average is $1.20, that is F.O.B. field tankage. It is then piped from the field, gathered and piped from the field to the refinery and taking the Imperial operation as a typical one, it is piped, gathered and piped from Turner Valley to the Imperial Refinery at East Calgary. This price I will deal with in a moment, the prices which are charged for transporting.

Now I think perhaps I should say what is perhaps obvious, that I have no instructions to make any attack upon the field price of crude oil in Turner Valley. It is realized, of course, by every one, that the getting of crude oil is a risky operation, and that many factors must be taken into account in arriving at what is a fair and equitable price and that cost alone would not be a sufficient guide to this Commission or to any one. At the moment I am chiefly desirous of bringing to the Commission the Company that posted the price, the particular executive, if possible, that posted the price and that he and his associates should be asked just precisely why, getting down to basic facts, why the price of 40 to 40.9 gravity was

posted at $1.14. Why was it not something more, why was it not something less? That, I think, will be agreeable, and the Imperial which posted this price will send someone from Toronto to explain to the Commission why that price was quoted, and to justify it as a fair and equitable price.

I might give the Commission a note on the history of that crude price. As the Commission probably knows from its own knowledge, crude oil was only found in Alberta within the last couple of years. The first price which was posted for crude oil in Alberta was, in Turner Valley, was posted on the 16th of December, 1936, and as a matter of interest the average, what is now the average refinery run, 43.4, at that time was posted as $1.64, it appeared in the range at that time as $1.64 per barrel. The next price that was posted was posted on the 1st of September, 1937, and that same gravity of crude oil was posted at $1.42, F.O.B field tankage, and then on the 5th of January, 1938, the present price was posted, which, as I have said, is $1.20 for what is now the average run through the pipeline. I may say that the first drop from $1.64 to $1.42 was for the purpose of putting refined products from Turner Valley crude as far as Winnipeg. At that time they extended as far as Brandon, and it was dropped for the purpose of extending the market for refined products from Turner Valley crude as far as Winnipeg. The second drop from $1.42 to $1.20 was for the purpose of further extending the same market as far as Port Arthur, Ontario, and Kenora, Ontario. The Commission has been directed to find out what the crude price should be, because of course it would have been senseless to have left out of your commission the field price of crude, and what

that price should be, because your principal task, as I see it, is to arrive at what should be a fair and equitable price for a gallon of gasoline in this Province, and as the gasoline in this Province is made from Turner Valley crude, it is obvious you must arrive at what is the fair price of Turner Valley crude, and you will be asked to examine the factors which enter into the determination of that price and I say that can best be done by bringing for examination and cross-examination, the Company executive or the Company official, or as many of them as are required, to show why the price was posted, and to give the factors which entered into it.

THE CHAIRMAN: Now on that point you have made mention of the Imperial Oil.

MR. FRAWLEY: Yes.

THE CHAIRMAN: As the poster of those prices?

MR. FRAWLEY: Yes.

THE CHAIRMAN: Are you only concerned with the Imperial Oil?

MR. FRAWLEY: I am only concerned with them because they post the price, that is the price which everybody else pays when it is posted, and I take it if we get what we might call a justification of that price from the Imperial, that that will suffice as I see it for the moment.

THE CHAIRMAN: There are other purchasers of crude?

MR. FRAWLEY: Yes, who follow the posted price to the decimal point.

THE CHAIRMAN: They do, do they?

MR. FRAWLEY: Oh yes. The price which I have

read to the Commission is what governs. That is the price.

THE CHAIRMAN: Would it be made to appear that they have an thing to say about the price which is posted or do they just blindly follow whatever the Imperial posts.

MR. FRAWLEY: That is the other Companies?

THE CHAIRMAN: Yes.

MR. FRAWLEY: That will be discussed. As a matter of fact the first price which was posted, as I told your Lordship, was posted on the 16th December, 1936, and that price in fact was posted by the British American Oil. Now if there should be any question, if the Imperial Company chooses not to take any responsibility,- and on the face of things perhaps they could,- for the original posted price of $1.64, for this same gravity, then of course, I am quite sure my learned friend, Mr. Harvie, will produce his people to show why they posted that original price of $1.64. To be frank, I anticipate no difficulty about that. I think the Imperial is just as prepared,-that is my information,- is just as prepared to explain the original posted price of $1.64 as they are the present price of $1.20, and to explain all about why the two reductions were made, and I may say, answering your Lordship's question, that there are purchasers who come over from Saskatchewan to purchase crude. Now this same price which I have read to you governs the price which they pay. They go to these people who have the oil to sell, and they pay that posted price and they, of course, also pay, if they buy at Calgary, after it has been brought in, they pay, of course, the posted price plus gathering and transportation charges plus a handling charge to put it on the cars for them to move it

to Saskatchewan points. I need not, perhaps, break what I am saying to discuss that at any great length. Frankly, there is a feeling on the part of some Saskatchewan refineries, and if it becomes of sufficient importance, we might bring some of them who speak, who complain rather, that they cannot come up into Turner Valley and buy the particular crude, that they cannot go to a particular well and buy a particular crude which they want, which they think is of a particularly good gravity for their particular operation. Now that takes us into other fields, of course. The present production of oil is subject, using the word in a large sense, to the control of the Petroleum and Natural Gas Conservation Board which was recently established in this Province, and if the Saskatchewan refineries find some difficulty in going to a refinery,- to a particular well,I should say,- and buying the total output of that well to move to Saskatchewan points, the difficulty which they experience is one which follows from the fact that the production has been pro-rated and that no particular well can sell exclusively its total output to a Saskatchewan refinery. To illustrate that, if I had a well in Turner Valley and I had a customer in Saskatchewan who would take, was willing to come to me and buy my total output, all I could possibly produce, I would not be allowed to sell him my total production because the pro-ration which has been imposed by the Conservation Board limits that well, and all other wells, to a certain percentage of the potential flow which can be taken from that well

MR. SMITH: You would be allowed to sell your

allowable?

MR. FRAWLEY: Oh yes. I could sell him what has been given to me by the Conservation Board, as the allowable number of barrels which I would be permitted to produce daily. Now I should stop there and add this, that I might be in a position where I may have made a contract with someone to give him and his company the exclusive production which I was allowed to take from that well. That is a matter on which there will be some evidence given to your Lordship. I am not prepared to say at the moment to what extent Mr. Nolan's client would insist upon the persistent and continued fulfilment of those contracts. I know, I do know that one well at least , has, so my information goes, not seen fit to sell his oil to the people with whom he contracted to sell it, and he has been selling it otherwise in the market, to farmers and so on. I think we should have him here to tell us his experiences with that contract, what the reasons were and so on, just to add to our knowledge with respect to that matter of contract. Certainly your Lordship will have to understand, the Commission will have to understand, the set-up in the Turner Valley with respect to production and production contracts.

THE CHAIRMAN: That is to say some refineries have taken the output of given wells?

MR. FRAWLEY: Yes, my Lord

THE CHAIRMAN: Will it appear that all of those wells are under contract?

MR. FRAWLEY: It will appear about how many. The majority are certainly under contract. As I understand it, my Lord the contract appears before the well touches and is brought into production, it appears at an early stage of course, because the refinery company also operates the pipe-

line.

THE CHAIRMAN: Do I understand that these contracts are limited in their carrying out by orders of the Conservation Board that have to do with pro-ration?

MR. FRAWLEY: Oh they would necessarily be limited. Now your Lordship is raising a very nice question and that is something which we will learn more of as we go along. I propose to show to your Lordship, and file with your Lordship, copies of the form of contract. Perhaps my learned friend, Mr. Nolan, may go further and submit two or three completed ones, executed ones. I have obtained from the Company some forms. We will examine those contracts and then we will study the effect which a pro-ration order will have upon the fulfilment of that contract. I presume the contracts are subject to any changes in the Statutory Law from time to time and their ability to perform and so on.

THE CHAIRMAN: Yes, it would be interesting to hear what the Conservation Board would have to say about pro-rating insofar as it has a bearing upon the subject matter of this inquiry.

MR. FRAWLEY. Yes, my Lord, the Conservation Board will, I think they expect to be, and will certainly be available, all of them or any of them, and can be brought to give evidence.

Now passing from that which I have called "the field price of crude", we pass on to the importation of crude and of refined petroleum products, and just for the sake of ready reference I have indicated that that matter has been dealt with in Paragraph (b) of the Commission.

"The cost of importing crude petroleum and refined "petroleum products into Alberta, and the laid down "cost of the said crude petroleum and refined products".

Now I have some figures on the importation of refined products. I have given you, I have already given you, Sir,- which I might have kept to give under this heading,- but I have already given you theimportation of crude oil into Alberta.

THE CHAIRMAN: If I may interrupt you so that I may understand you as you go along, your starting point is the field price of crude, I take it?

MR. FRAWLEY: Yes, my Lord.

THE CHAIRMAN: Now you propose to adduce evidence to show what it is, you propose calling evidence with a view of showing that that price is too high or too low or just right?

MR. FRAWLEY: Do I propose?

MR. CHAIRMAN: Yes?

MR. FRAWLEY: I propose to call the man who made it and examine him and arising out of that I would have some submissions to make as to whether it is too high, just right or too low.

Now then, passing to the matter of importations of both crude and refined products, I have given you in what I have called for convenience sake, "Statement "C"", and when they are submitted to the Commission and to my learned friends, it may still be called "Statement "C"", I have given you in that statement the importations of crude in the year 1938. That can be elaborated to any end with respect to 1937 and 1936, and so on.

Now dealing with the importations of refined products and this is a very interesting aspect of the Commission's Inquiry, I think, this statement which I have shows that, gives the importations of refined products into Alberta

from the United States of America as shown by the Provincial Secretary's records for the year 1938, and I have it classified as to the people who imported it and the number of barrels month by month, beginning in January and ending in August, and I think that should be on the record. I find that Artic Oil Sales of Lethbridge, imported in January, 117 barrels. Now your Lordship understands that it does not come in in barrels but for convenience sake the gallons have been translated into barrels, in the month of January the Artic Oil Sales, Lethbridge, which is a purely marketing organization, imported 117 barrels. The Gas & Oil Products which is a Calgary refining and marketing company imported 73 barrels. The Huff Refinery which is a marketing and refining organization in Lethbridge, imported 175 barrels. The Lion Refining Company of Calgary imported 347 barrels. Oughton Brothers, a firm of marketers in Calgary, imported 381. The Richfield Distributors of Calgary, imported 39. The 77 Oil Company of Lethbridge imported 110. There were imported by miscellaneous dealers and consumers 1737. The Texas Company imported 8,518 barrels. H.N. Trimble & Sons, Calgary, 250, and the Hydro Pete, Mr. Hyde's Refinery at Red Deer, imported 133 barrels. That was in January, and in February the figures were Artic Oil Sales 77 barrels, Gas & Oil Products 187 barrels, the Huff Refinery 115 barrels, the Lion Refining 415. The Richfield Distributors 77, the 77 Oil Company 374; miscellaneous dealer and consumer importations were 866; the Texas Company imported 6521 barrels; the Trimble Company 178 barrels.

in the month of March the Artic Company imported

113; the Becker Company of Calgary, Alberta 77; the Drumheller Independent Oil Company imported 36; the Gas & Oil Products imported 293; the Huff Refinery 390; the Lion Refining Company 566; the 77 Oil Company 606 barrels; miscellaneous dealer and consumer importations were 2417; the Texas Company imported 9,118. H.M.Trimble & Sons imported 709 barrels, and the Hydro Pete Refinery 100 barrels.

In April the Becker Company 115; the Gas & Oil Products 154; the Huff Refinery 720; the Lion Refining 433; Oughton Brothers 189; the 77 Oil Company 842; miscellaneous dealer and consumer importations 3802; the Texas Company 15,931; the Trimble Company 1659 barrels, and the Hydro Pete Company 273 barrels.

In the month of May the Becker Company imported 239 barrels; the Drumheller Independent 142; the Gas & Oil Products 339 barrels.

Your Lordship will remember there are thirty-five Imperial gallons in each barrel.

The Lion Company none; Oughton Brothers none; the Richfield Distributors none; the 77 Oil Company 1444; miscellaneous dealer and consumer 4829; the Texas Company 21,435 barrels. The Trimble Company 2114; and the Hydro Pete 488.

In the month of June the Becker Oil Company 309; Huff Refinery 293; 77 [illegible] 1307; [illegible]iscellaneous dealer and consumer 3611; the Texas Company 13,781; H.M.Trimble & Sons 1485, and Hydro Pete 691.

In July the Becker Company 406; Drumheller Independent 39; Gas &Oil Products 37; the Huff Refinery 150; the 77 Oil Company 969; miscellaneous dealer and consumer 4,237;

the Texas Company 25,951; H. M. Trimble & Sons 1710,

In the month of August, and I have only these figures to August, the Becker Oil Company 406; Huff Refinery 380; 77 Oil Company 1810; miscellaneous dealer and consumer 4824; the Texas Company 21,343; the Trimble Company 5456, the Hydro Pete 426 and the British American Oil Company Limited at Coutts 191 barrels.

The total importations month by month, January, 12,180; February 8,810; March 14,425; April 24,118; May 31,555; June 31,477; July 32,935; and August 44,836.

My friend, Mr. Smith, is interested in these figures, of course, because his clients are now spending some money to call the attention of the public to the advantage of buying gasoline from Alberta crude, and the figures I have given you give some indication of the extent to which, notwithstanding the production of crude oil in Turner Valley, Montana products are still coming into the market to be sold in Alberta.

THE CHAIRMAN: I was just going to ask you, that importation is from Montana?

MR. FRAILEY: These importations are from Montana.

THE CHAIRMAN: And the duty?

MR. FRAILEY: There is now a duty of one cent per gallon. I might say that there was, up until the report of the Tariff Board in May of 1936, there was a duty of two and a half cents, and then in the United States-Canada agreement, reciprocity agreement, it was dropped to two and a quarter cents. It was two and a quarter cents when the application was made to the Tariff Board in 1936 to have it removed altogether, and at that time the report of the

Tariff Board recommended a reduction in duty to one cent, after having examined, going into the costs of marketing and refining, recommended a reduction to one cent and there is now, therefore, one cent a gallon on gasoline and distillate tractor fuel and that sort of thing coming in from Montana.

Now the principal importer of gasoline into Alberta is the Texas Corporation. The Texas Corporation is an American corporation which has a very modern refinery at Sunburst, Montana, which is just eight miles South of Coutts on the Alberta line. That Company makes gasoline and ships into Alberta, and it is sold throughout Alberta, the Company having at the moment seventeen wholesale outlets, and a great many service stations, some of which they own and some of which they do not own, but a great many service stations to which they make deliveries from their seventeen wholesale outlets, that is the Texaco. Now we will examine the Texas Company's laid down costs which in itself is not a very difficult thing, because that only means to take the price to the Texas Company of Canada Limited, which is the American marketing company, they have a separate corporation, the Texas Company of Canada, and that Company purchases from the International Refining Company at Sunburst, Montana, which is the Montana subsidiary for the purpose of refining; As I say that would not be very difficult if we simply took the invoice price of the gasoline from the International Refining Company to the Texas Company of Canada Limited at Calgary, and added the freight, either by tank car or by truck, because it comes in in both ways We would soon arrive at the laid down cost by I propose to do much more then that, my Lord, and I propose to endeavour to make every possible effort to obtain the refinery door cost at Sunburst of this gasoline; in other words, what it costs

the Texas Company at the refinery door before it is shipped and just as it is about to be shipped up to the Texas Company of Canada Limited. Now very frankly, in the Tariff Board Inquiry of 1935 which I attended on behalf of the Province of Alberta, an effort was made to obtain those costs and we were not successful, but I intend to make another effort and I am really hopeful that I may get those costs.

THE CHAIRMAN: What was your difficulty?

MR. FRAWLEY: Oh, everything is outside the Province of Alberta and outside of the Dominion of Canada for that matter. I will quite frankly state unless there is co-operation from the Texas Company I will not get one single part of those costs, but I think the Texas Company will give me those costs, allow and give me access to those costs and allow Mr. Cottle to examine them and report to this Commission just what they are.

THE CHAIRMAN: Well have you not the Company in Canada?

MR. FRAWLEY: Yes, we have the Texas Company of Canada Limited which merely buys gasoline from the International Refining Company, its sister Company in Montana.

THE CHAIRMAN: Yes.

MR. FRAWLEY: And the Texas Company of Canada does not know at all, does not know at all, what it costs to make the gasoline at Sunburst, Montana. Those costs are in the State of New York in the Chrysler Building, as a matter of fact, but I say, Sir, I think they can be got because it is of great value to this Commission, great value to this Commission for two practical obvious reasons, one, to find out the real laid down cost of this Company's gasoline in the City of Calgary, to find the real laid down

cost and to compare that with the laid down cost, compare that with the Imperial Oil Company's price for gasoline, in the City of Calgary, namely sixteen and a half cents, and I want to know whether or not the Texas Company of Canada puts that gasoline into its tanks in Calgary at more or less than sixteen and a half cents, and how much more and how much less and that can really only be gotten by examining the Refinery costs at Sunburst, and as I say I am hopeful of getting it. I may not get it at all, but I hope to show that to the Commission.

THE CHAIRMAN: The refinery costs in turn, I suppose, will depend in some measure on the cost of crude?

MR. FRAWLEY: Oh yes, and they own the crude. They buy some crude. They buy some crude and they produce some crude, and they make that at Sunburst into gasoline which comes into this Province. It will be a task, but if I can get anything from them at all I think it would be enlightening to this Commission and that is the only reason I have for talking about it this morning.

THE CHAIRMAN: And if you do not get it your starting point with respect to the Texas Company in Canada is whatever price the parent Company may choose to fix?

MR. FRAWLEY: Oh yes, and which I have seen and which are there over in their offices on 8th Avenue in the form of invoices. That is there.

THE CHAIRMAN: Yes, and which may be excessive or low as the case may be.

MR. FRAWLEY: Yes.

THE CHAIRMAN: Depending upon factors which you may or may not be able to make proper inquiry into.

MR. FRAWLEY: That is true.

MAJOR LIPSETT: Is the Canadian Company a wholly owned subsidiary?

MR. FRAWLEY: Oh I think undoubtedly. Just in view of the fact that there is a sizeable amount of gasoline coming into this Province, and I think it is felt that there is too much coming in, having in mind various interests, we will examine into the cost, the laid down cost, and the operating costs. Of course before I leave the Texas Company, we will examine into their costs under another grouping, but I will leave that for the moment. For the moment I am only speaking of their laid down cost of gasoline. I should say the Texas Company, according to my information, does not import all of the gasoline which it sells from Montana. My information is, and that will be proved, that they import only what they call their "branded product", their Ethyl gasoline and their Fire Chief gasoline, that is their regular gasoline. There is also sold in almost every service station in Alberta a third gasoline and my information is that they buy that gasoline from refineries who manufacture it from Turner Valley crude.

The other people, some of these people, like the 77 Oil Company of Lethbridge, because their importations would appear to be of some size.....

THE CHAIRMAN: When you say a third group, is that quality, is it deemed to be of lower value?

MR. FRAWLEY: Oh yes.

THE CHAIRMAN: And sold at a lower price?

MR. FRAWLEY: Yes, third in every respect. I will discuss that in a moment.

Then I think it is right to examine into the set-up of some of these other people who are making spasmodic importations, not regular importations. I do not know anything about the 77 Oil Company at all but I have been told it is operated almost as a subsidiary of a Montana refinery, and that there is a pretty consistent importation there of Montana gasoline which does not reach very far up into the Province, but which is sold in the Lethbridge area and it will be interesting to examine that Company's laid down cost and compare it with the posted price of standard gasoline in the City of Lethbridge, for instance , which is, I will stop and give it to you, my Lord, is 17.7 cents. It will be interesting to compare the laid down cost of that gasoline, compare quality with quality I mean, with the standard price, with the posted price of standard gasoline at Lethbridge of 17.7 cents, because I think that this Commission should know whether or not these people who import Montana gasoline can import and sell at a profit, whether or not the posted price of the Imperial Oil Company in this Province is a sufficient umbrella, to use that expression, to enable these people to go into Montana to buy gasoline and sell it to the public in Alberta at a profit. It would be very interesting to know and it would clear up a lot of misunderstanding and confusion, as to whether it is being done at a profit or at a loss.

Then there I should mention something which is

bound to arise when one is considering this matter of importation.....

THE CHAIRMAN: Now these people who are importing the gasoline you speak of, will it appear that they are selling it to the public at the same price as those who are selling gasoline from Turner Valley refineries?

MR. FRAWLEY: Yes, my information is as late as yesterday that they are selling at the same rate in the market as the Imperial Oil's regular gasoline, and that will all be subject to proof because if they are not that affects the situation again.

THE CHAIRMAN: That is to say, paying hauling and duty they sell at the same price as those who sell from the refineries in Turner Valley?

MR. FRAWLEY: That is correct, my Lord, Certainly the Texas Company is doing it, they are selling at the same price, of course, as the Imperial Oil, and we will find out whether or not these small importers, but still consistent importers, people who seem to be carrying on their business on Montana gasoline, whether they are cutting prices or whether they are availing themselves of the price structure of the Imperial Oil.

Then I should mention here in passing that the Ethyl gasoline contract and licensing system enters into that matter of importation of standard gasoline from Montana. The Ethyl Corporation licences are limited territorially. In other words, if I am a refiner at Great Falls, Montana, I can make Ethyl

gasoline,- I will discuss that with your Lordship more fully in a moment,- I can make Ethyl gasoline, but when I come to sell it I am limited to a certain piece of geography and it simply means this, that I cannot sell it outside the State of Montana. In fact, it might be more limited than that, but certainly if I was a refiner in Great Falls, Montana, and desired to sell some gasoline to somebody in Alberta, some gasoline made with Ethyl fluid, I cannot do it because my contract is limited territorially. Now there is at least one instance of that with a consumer, a large consumer, in Edmonton. He spent a lot of money on a big fine truck, tank truck, and sent it down into Montana to buy some gasoline comparable to what he had been buying from the Alberta refineries, and he found he could not do it, because of that Ethyl limitation. I simply mention that in passing.

THE CHAIRMAN: I take it then, that there is an Ethyl Corporation?

MR. FRAWLEY: Yes.

THE CHAIRMAN: Which has patents?

MR. FRAWLEY: Yes, I should not have mentioned that now because I am coming to that in a moment. I am coming back to it.

THE CHAIRMAN: Very good.

MR. FRAWLEY: But before I leave that, your Lordship, might very well ask me, how does the Texas Company bring it in? That is a perfectly obvious question, because the International Refining Company is a wholly American entity, and manufactures in Montana

under a licence issued to it there by the Ethyl Gasoline Corporation, but there must be obviously some special clauses in that contract which permits that gasoline to come into Alberta, although they are operating under a refining licence issued in the State of Montana.

MR. SMITH: You mean the Texas Company can bring it in and other people cannot?

MR. FRAWLEY: Well that is putting it very roughly and subject to learning more about it later, that is what I understand. You understand I am in a sense opening to the Court and covering a lot of ground of which I will bring proof, but I can make that statement believing it to be true. We have come to certain conclusions about that which I will mention when we deal with the situation of the Ethyl Corporation in this Province.

MR. SMITH: I was merely anxious to understand, I was not criticising it.

MR. FRAWLEY: Yes, I understand. Now we pass then to the item of the refining costs and refining costs are dealt with in the following paragraphs in your Commission, Paragraphs (c), (i), (l) and (m), and I will read each of them.

"(c) Costs of refining and processing crude petroleum in the said Province and particularly the adequacy and efficiency of present refineries and the reasonableness or otherwise of depreciation and other charges included in existing refining costs, and what the fair and equitable

cost of refining and processing crude petroleum in the said Province should be".

(i) The profits of persons, firms or corporations engaged in the importation of crude petroleum and petroleum products into the Province of Alberta or in the refining, producing and supplying either by wholesale or retail of crude petroleum or petroleum products in the said Province and the reasonableness or otherwise of the said profits."

"(l) Whether any charges of any description made in respect of the production, processing, handling, gathering or distribution of crude petroleum and refined petroleum products or any of them is excessive or unreasonable having regard to the matter or thing for which the charge is made."

"(m) Whether any expenditure is incurred in or incidentally to the production, processing, handling, gathering or distribution of crude petroleum, and refined petroleum products or any of them which is either wholly or partially unnecessary or which is not essential or is not in the public interest."

Now this is, of course, one of the most important of

the charges which have been placed upon the Commission in this Inquiry. It will entail audits and very extensive audits, and examinations by accountants. Further it probably will entail appraisals by experts because I feel that this Commission is in this position, that it is not taking anything for granted at all with respect to the cost of turning a barrel of crude into a barrel or as much of a barrel of gasoline as can be got from a barrel of crude. Now at the moment in this Province there is only one major operation being carried on, or I might put it this way, the only major refining operation is being carried on by the Imperial Oil Company at its plant in East Calgary. At the moment that Company refines for itself and for the British American Company on a custom basis. The British American Company, for undoubtedly good reasons, has discontinued its refining on a major scale and it now has its refining done for it on a custom basis. In other words it gives the crude, it turns the crude over to the Imperial Oil Company and what the arrangement is and all the details of it we can find out.

The average daily through-put of the Imperial Refinery at East Calgary was in the month of June, only to take a few months, in the month of June 8,000 barrels; in the month of July 11,000 barrels; in the month of August about 8,000 barrels per day; in the month of September, we have not got that yet.

THE CHAIRMAN: Those figures you have given us are all per day?

MR. FRAWLEY: That is the average daily run was 8,000 in June, 11,000 in July and 8,000 in August.

The British American Company has a subsidiary called the Bell Refining Company, and it operates at Calgary now, and has only been operating for a short time. It now runs an average of 900 barrels of crude daily. That plant was only reopened in August last and I am told it was because there was an unprecendented demand for petroleum products at harvest time, and they felt that they were not getting all that they needed from the Imperial Company and they reopened their Bell Refinery at Calgary and have been putting through an average of 900 barrels. It is only a limited operation. It is not a complete refining operation. The crude is only given a distillation process, and what is called "straight run gasoline" is taken from it, which leaves, of course, a great deal of the crude untreated and unprocessed, and that remainder called "blotting" is shipped to the British American Refinery at Moose Jaw, and it there enters the refining operations of the British American Refinery at Moose Jaw. That can, perhaps, be called a temporary operation, because as your Lordship perhaps knows, the British American has already undertaken the construction of a refinery,- I have heard it referred to as a million dollar refinery, so I imagine that is a fair description of it,- they have undertaken the construction of a large refinery in the City of Calgary. They still operate at Coutts. Until recently the British

American Company had quite a major operation at Coutts, using Montana crude, but when crude was found in Turner Valley there was a desire, of course, to use that crude, and to eliminate Montana crude entirely, and so the British American Company which had been using Montana crude at its Coutts plant discontinued its operations there. Similarly the Imperial Oil Company which operated a refinery at Coutts through its subsidiary, the Maple Leaf Petroleum Company, it also discontinued its Coutts' operations, using Montana crude, and began to use exclusively Turner Valley crude, So that is what we can say about the British American at the moment, and it is not important because I think in both instances, it is a temporary operation, at Coutts they use Montana crude to supply local requirements. They are not making standard gasoline, not making Ethyl gasoline, simply making the third structure gasoline for local requirements, and the same thing, I think, is true with regard to the operation of the Bell plant at Calgary.

I should say, by way of correction, that the Imperial through-put which I gave in August as about 8,000, it is more than that, it has an average daily run of 9300.

Then the next refining operation in importance is the Gas & Oil Products, owned by Mr. A.H.Hayland of Calgary. That company operates a plant at Turner Valley and uses,- I do not want to get too involved in what might become technical, but putting it in my language, there are two operations combined there. Turner Valley crude is refined, using of course,

the distillation method. There is no cracking there, and also the absorption plant which manufactures absorption gasoline very naturally becomes important. Now to give the Commission some idea of the size, because at the moment that is all I am making these notes for, that plant has an average daily run of about a thousand barrels of crude and absorption naphtha.

The next operation in size is the Lion Company of Calgary, and that is also a straight run operation. They now use Turner Valley crude altogether, and they have a daily, average daily run of about 350 barrels.

Then there is the Company called the Becker Refining Company which operates in Turner Valley, which is also a straight run, distillation operation and that Company has an average daily run of 400 barrels.

Then the operations at Wainwright are very small but they do use some Turner Valley crude, but not a very large amount, only about 40 barrels a day of Turner Valley crude. The rest is the Wainwright crude. I think, as a matter of fact, they used to bring in some American crude, some high gravity crude from the Mid-Continent. I do not know whether they have discontinued that or not, but the importance of the industry in Alberta is perhaps indicated by the size of these operations. Then there are some very small operations which do use Turner Valley crude, the Monarch Refinery, the

Okotoks Refinery and Mr. Hyde's refinery at Red Deer, the Hydro Pete. They all use Turner Valley crude. The amount of their average daily run I have not got, but when we are making our submissions we will give all that to the Board.

Then there is one more refinery which should be mentioned and that is the Huff Refinery at Lethbridge. That Company uses Montana crude exclusively. Whether exclusively or not I do not know but they use it largely.

Now with regard to the question of refining costs, as I have said, that will be a major part of this Commission's work. We must examine the Imperial Oil Refinery costs of course, because it is that Company that makes the price at which competitive products are sold in Alberta, and therefore, we will have to go into their offices in Eastern Canada and ascertain what those costs are. That was done once before in 1935 and 1936 by Mr. Cottle. Of course it will have to be done again.

THE CHAIRMAN: I do not perhaps fully appreciate why you say that the Imperial fixes the price?

MR. FRAWLEY: Yes, my Lord, I will deal with that.

THE CHAIRMAN: Why should not any Company that can sell at a lesser price and finds it desirable to do so, why does it not do so?

MR. FRAWLEY: The answer to that is, there is no law against them doing it but for some reason or other they do not do it. I want to show you what I mean when I say the Imperial makes the price. I

am glad your Lordship has brought it up. When one looks, this is what the oil men, all the oil men know and read, or something similar, the National Petroleum News, and when he wants to find out what the price is of gasoline or the price at which crude oil is selling, he looks at this book. Your Lordship will become a subscriber of it from now until March or April, and we find, when we look under tank wagon market, we find this "Canada, prices of Imperial Oil Limited, per Imperial gallon", which is 1.2 American gallon, Three Star Gasoline. I was going to give this to your Lordship a moment ago, Hamilton, Toronto, East and West, to Halifax. Now I do not know whether this is any more than just the prices of Imperial Oil Company. I have in front of me a document called "Imperial Oil Limited, Alberta Division,, posted tank wagon and barrel selling prices, refined oil and gasoline", effective September 8th, 1938. Now that is prepared by the Imperial Oil Company, but I will guarantee to your Lordship that if you want to find out the price at which the British American Oil Company of the Texas Company is selling regular gasoline at Cluny in the Province of Alberta, that all you have to do is to look at this sheet of paper and find that it is 18.2 cents, although that is Three Star gasoline, the Imperial Oil Company's gasoline, and so I do not know and do not care whether the Imperial Oil fixes the prices in Alberta, because as often as I have made that remark to them "You have fixed the price", and they

say "No, no, we fix the price of our own gasoline in Alberta, but no other area." There is the big marketer and I suppose it falls to the big marketer to fix the price. Other people can follow or deviate from it if they like, but I have no great doubt that if the British American Oil Company tomorrow morning decided to sell gasoline in Calgary not to say at sixteen and a half cents but at fifteen and a half cents, that there would be what is known as a price war on. The Imperial Oil Company would meet that and so on, and that leads into other considerations, that is at least the price at which gasoline is sold in Alberta by everybody who is selling standard gasoline, and I say standard gasoline, we go to third grade gasoline, it doesn't make any difference. The third grade is called by the Imperial "Acto gasoline" for country business, and in city business in Edmonton and Calgary "Turner Valley gasoline". Now your Lordship will wonder about that, but that is not particularly important. I understand that as a matter of fact they are endeavouring to consolidate those two gasolines. They are third structure gasolines. Whether one differs very much from the other, it is not material, but when you want to find out what third quality gasoline is selling for in Macleod by any Company,- no, I should not say by any Company, I should say this, when you get into the third structure gasoline we find that the smaller refineries like the Lion Refining and perhaps also the Gas & Oil Refinery, that there is no great adherence there, there is no firm adherence to the Imperial Oil prices when we get into

the third structure gasoline, but what I want to impress upon your Lordship is that with respect to branded gasoline, that is Ethyl gasoline and Three Star gasoline and Esso. Those are terms which you will meet a lot. Ethyl gasoline is a gasoline which is made by adding ethyl to it and the standard regular gasoline is made by the use of lead also. Another way of describing them is the octane number, and I was coming to that in a moment but I may as well discuss it now. Ethyl gasoline has an octane number of about 76 by one method of test and 76 by another method. The regular gasoline has an octane number of 70, and I want to make it as clear to your Lordship and to the Commission as possible now. One might call these two gasolines which I am talking about, 76 octane gasoline and 70 octane gasoline, and perhaps that would be as helpful as any other way.

Now with respect to those two kinds of gasoline I say there is no question at all, it is the price that the Imperial Oil has fixed for those two kinds of gasoline which is the going price, and the only price at which those two kinds of gasoline, by whomsoever they may be made, are sold in the Province of Alberta, and those two prices in Calgary today are sixteen and a half cents for 70 octane gasoline and nineteen cents for the Ethyl or 76 octane gasoline.

THE CHAIRMAN: Price to whom?

MR. FRAWLEY: That is the price to the dealer, that is the wholesale price to the dealer, the person who comes to the service station to buy it

pays more and I will discuss these retail spreads with your Lordship in a moment.

Now when we go to examine into the question of the Imperial Oil refining cost, perhaps I need say no more now by way of indicating what I propose to direct myself to, and it falls into two main categories, one, I intend, if possible, to give to this Commission some opinion with respect to the efficiency of the Imperial Oil Refinery in East Calgary. Now that is a very large expression, but what I mean by that, is there any unnecessary expenses involved there, dealing with those sections in the Commission which I have referred to, is there any unnecessary expense involved there in taking a barrel of Turner Valley crude and making it into two-thirds or three-fifths of a barrel of gasoline, in other words, is it as up-to-date and efficient as it might be. There may not be the slightest but I want to indicate what my line of thought is. If there should be some inefficiency there, if it should cost too much, for one example, I understand the Turner Valley crude, there is a peculiar sulphur content which has to be got rid of, or you cannot make good gasoline out of it. Is the method used by the Imperial Oil to get this particular sulphur content out of this crude the best and most economical and cheapest? That is one heading. The other heading, of course, which is of great importance is, is too much depreciation and administration cost being charged in connection with the operation of that plant?

THE CHAIRMAN: Does the first involve, supposing you found efficiency in removing the sulphur, does that involve the question of the capital expenditure necessary to instal the machinery to do it?

MR. FRAWLEY: Yes, my Lord, and the cost of carrying that and the depreciation of that and all those things.

THE CHAIRMAN: Yes.

MR. FRAWLEY: Then in making up their costs, some of which I have already received from the Imperial Oil Company for the year 1937, there are a dozen or so groups of the different kinds of costs involved, and one of them is, appears under the general description of "depreciation and general administration". Now if with respect to those costs, those figures, which of course I certainly do not intend to disclose at all at the moment, it is with respect to those figures that there will be some examination by Mr. Cottle and a report to this Commission as to whether or not those administration and depreciation charges are warranted insofar as this Commission is concerned, and insofar as the price which the consumer of one gallon of gasoline in the Province of Alberta is concerned. As I say that will be subject to analysis and reports to this Commission, and if there are any charges or any investments appearing in the refining costs of the Imperial Company,- I keep talking about the Imperial Company for this purpose,- then by virtue of certain paragraphs appearing in that Commission I will ask this Commission to disregard them in arriving at what should be the fair and equitable price of a gallon of gasoline, or perhaps the fair and

equitable cost of refining a barrel of gasoline in this Province.

MR. SMITH: I wonder if Mr. Frawley would excuse me, Sir, and permit me to make a suggestion to him. I am not interested in the exact thing that he is talking about at this moment, but having had some experience with Commissions, I am going to make a suggestion to him or at least to the Commission, and one which I hope he will adopt. I am interested in the cost of producing a barrel of petroleum. That necessarily means the examination of books of the Companies whom I represent through the Alberta Producers Association. My suggestion is this that we would get much further if the things which are required of us, and I speak for all of us I think, aside from the Commission Counsel, if the things which are required of us should be asked for in writing, that is the things that they want us to produce for them, and the necessary work which we would have to do to answer those questions, that that in the first place should be in writing and then in the second place the thing he is speaking of now, that is the examination by Mr. Cottle at the moment of the Imperial's books, but I am assuming it will involve an examination perhaps of our books in connection with one thing with which I am interested, and it is this, that when that examination and report which he is suggesting is made, it should be submitted to us before it is submitted in public to the Commission. What I have in my mind is exactly this. I think it would avoid delays on the part of the Commission and it would tend to avoid information which may be had

going before the public in the absence of its immediate answer, and if we had these things and were given some time to examine them, we then all of us might have our answers ready, I mean at least in general form, and I say that in fairness, I think, to ourselves, and to my people. We would like, if there is something wrong or they think there is something wrong, that we should have a chance to examine it and have our answer ready at the same time that that information is made public before you. I think it is a reasonable request and I think it is, the scheme has been adopted in other places. The Commissions that I have in mind are the hearings before the Utilities Board where the examinations of the Companies' books were made by the late Mr. Frank Harvey, and those examinations were made in the most friendly way, and the results were communicated to the Company, with the result that when the hearing started, it proceeded right along, and there were never any delays in it because we were prepared to get our answers ready, knowing what was going to be said, and in that way there were no delays and there was no sort of one-sided publicity, if I may use that expression, through the newspapers, because the answers were there with, if I may also use the expression, with the accusations. I make this suggestion for your Lordship's consideration and my learned friend's consideration. It seems to me perhaps the better way to operate.

THE CHAIRMAN: Well, of course, you appreciate, Mr. Smith, that is entirely a matter for Mr. Frawley and not for this Commission. We are here to hear what evidence is called before us.

MR. SMITH: I realize that, Sir, fully.

THE CHAIRMAN: If Mr. Frawley thinks it will expedite the work of the Commission and after all he will be concerned with doing that, to adopt what you suggest, no doubt he will be glad to do it, but if there is some reason that it would be a disadvantage he, no doubt, will not do it.

MR. SMITH: With the greatest respect to what your Lordship has just said, your Lordship has the direction of this Commission. Mr. Frawley is merely Counsel for you with the duty of bringing before you such evidence as he thinks fit. As to how that evidence shall be received, surely that is your problem and not his, and it seems to me that what I have suggested is directly within your authority.

THE CHAIRMAN: Quite so. We are making the inquiry certainly. Mr. Frawley is only Counsel to the Commission, but what that Counsel does in introducing his evidence, whether or not he will disclose it all to you first is something which it seems to me should not be interfered with.

MR. SMITH: I am speaking of the examinations that are made with respect to costs, by expert people who have disagreed before this, and that being a matter largely of figures and so on, that if they come to some conclusion, that they are going to call some evidence, it will be in the form of a report, I am sure, no doubt it will be in the form of a report to the Commission, and I am suggesting that I should have access to it so that we can have the answer ready. I think Mr. Frawley will agree with me that that would expedite the matter when it comes before your Commission.

THE CHAIRMAN: Perhaps he will do that if you appeal to him.

MR. SMITH: I thought I should make the suggestion to you because I think it is a matter for your direction.

THE CHAIRMAN: We will hear any evidence offered but if we think the field is not covered on the point, we of our own motion, if necessary, will call other witnesses to clarify the situation until we are satisfied, but we will not say to you that you must show something to Mr. Nolan or to Mr. Frawley, but all Counsel, I take it, will be concerned with making the matter clear, and in any way possible expediting the work of the Commission, and any suggestion which leads to that end, no doubt Mr. Frawley will consider it.

MR. SMITH: I do not want to appear to be arguing with you but what you are going to say is that our books are available to Counsel for the Commission, that is something for the Commission to say.

THE CHAIRMAN: Yes.

MR. SMITH: And I have no doubt you will say that. Now having said that, all I am suggesting.....

THE CHAIRMAN: Your suspicion is well founded.

MR. SMITH: I have no doubt about that at all. You were saying a moment ago Mr. Frawley is doing these things, but he can only do it because the Commissions says he may, and I do not think he has any other authority.

THE CHAIRMAN: Quite. All I wanted to make clear, Mr. Smith, is that we are not going to conduct this Inquiry in the sense of being referees between Counsel. I am assuming that the Counsel who are before

me will get together and facilitate the work.

MR. SMITH: We all hope that that will not arise, that that situation will not arise.

THE CHAIRMAN: If you do not call the witnesses that we think will give us the information upon the points upon which we are charged with the responsibility of making this Inquiry we will call them ourselves, and to the extent that we have power we will see that they are here, and to the extent that we have power we will see that they produce everything that they should relevant to the point. Now as to the, I might say, the method of adducing evidence and so on unless it appears to us important to do so, we do not wish to be concerned with the work of Counsel.

MR. SMITH: You can probably leave it for some subsequent application if the question arises.

THE CHAIRMAN: Quite so.

MR. FRAWLEY: If it is necessary to go into my learned friends' clients' books, I do not say it is necessary now, but anything which is submitted to this Commission my learned friend will have an opportunity of looking at it. Supposing Mr. Cottle reports. Mr. Cottle will have to be cross-examined on it by Mr. Smith, and if I think it will expedite, and I think there is great merit in what my learned friend has said, but I want to clear up something, my friend interrupted while I was talking about the Imperial Oil Company refining costs.

MR. SMITH: Yes, I said I was not interested at the moment in that particular item, but I thought that

the appropriate time to make the suggestion which I did.

MR. FRAWLEY: Then with regard to the British American Company, they had an operation at Coutts in 1937 which for comparison purposes, and unfortunately for comparison purposes they have nothing in 1938, but they had an operation in 1937 which, for comparison purposes, we might very usefully examine, and submit to this Commission with a view to permitting it to arrive at what the correct costs are.

Then I repeat that it would be exceedingly useful to obtain from the Texas Corporation their Sunburst refining costs.

The next thing that I want to call to the Commission's attention is what I have referred to in one general classification, "pipe-line costs", and that appears in the Commission, I mean for reference purposes I will look at paragraph (d).....

THE CHAIRMAN: Before you go to that, well, yes, I suppose the pipe-line costs will properly come in there before you approach the cost of the distribution of that gasoline by middle men to the public?

MR. FRAWLEY: Yes.

THE CHAIRMAN: Yes.

MR. FRAWLEY: Pipe-line costs can be said to be covered in the Commission in Paragraphs (d), (i), (l) and (m),

> "(d) The cost of gathering, handling, and transporting in Alberta of crude petroleum and of refined petroleum products, and without limiting the generality of the foregoing."

(1) the rates charged for thegathering, handling and transporting of crude petroleum by pipe-line or otherwise from Turner Valley to Calgary in the said Province, and what the fair and equitable rates for such gathering, handling and transporting should be.

(2) the adequacy and efficiency of present pipe-line facilities, and

(3) whether existing pipe-line facilities result in or tend toward an unwarranted control of the price of either crude petroleum or refined petroleum products."

The other item "(i)" is the profit paragraph and "(l)" and "(m)" are the two paragraphs which give to the Commission the right to eliminate from consideration in arriving at the fair cost any item which they think, any expenditure or charge which they think is unwarranted.

Now the pipe-line in Turner Valley is owned, as I understand it, by the Royalite Oil Company.

THE CHAIRMAN: Before you embark upon the consideration of this paragraph, I think we had better make this a convenient time to adjourn, so that we may have the whole subject from the beginning, as you discuss it.

(The Hearing was here adjourned and resumed at 2 P.M.)

.....

2:00 P.M.Session.

THE CHAIRMAN: Apparently Mr. Mahaffy is going to rest and not hear you for a little while.

MR. FRAWLEY: Does your Lordship think I should go ahead?

THE CHAIRMAN: If he is about in the hall.

MR. FRAWLEY: He has told us this morning that he was representing Great West Distributors and he may not be very much interested in the pipe-line.

THE CHAIRMAN: If he is not there we will go on. Go on, Mr. Frawley.

MR. FRAWLEY: I was just pointing out the matter of the pipeline cost part of the Inquiry, which has been committed to you. Now, as I understand, the pipe-lines in Turner Valley are now owned and operated by the Royalite Oil Company. There was a Company known as the Alberta Pipe-line Company, which was a subsidiary of the Regal Refining Company, and that Company, the Regal Company, was taken over by the Imperial, and I presume that the Alberta Pipe-line Company lost its corporate identity. Mr. Harvie can tell us about that.

MR. HARVIE: Yes.

MR. FRAWLEY: And it is now a part of the Royalite Oil Company, so that the pipe-lines which carry the crude oil from Turner Valley to Calgary are owned and operated by the Royalite Company. There are some of it six inch and some of it was four inch. It will all be submitted in detail to the Commission, by a map. I have a map which is rather valuable, showing in different colours, it is one of the Dominion Government topographical maps and it shows how the line runs across the country to Calgary.

Now, the history of the pipe-line charge

from Turner Valley to Calgary is a very short one and one that may be of some interest. From the first of January, 1933, to the 20th September, 1933, the rate was thirty cents per barrel, and at that time there was an average daily capacity carried of 1479 barrels. From the first of October, 1933, to the 3rd of October 1936, the rate was twenty-five cents a barrel and the average daily run of 2208 barrels. From the 4th of October to the 31st of August, 1937, the rate was twenty-two and a half cents with an average daily of 4,529 barrels. Then, from the first of September, 1936, to the 4th of January, 1938, the rate was reduced to seventeen cents, and it was seventeen cents during that period with an average daily of 9,787 barrels, almost 10,000 barrels a day. Then, from the 5th of January, 1938, until now, the rate is fifteen cents, and during the period, 5th January, 1938, to 31st August, 1938, the average daily carried was 15,662 barrels. The rate, therefore, is fifteen cents, that is the rate for gathering and for carrying. The gathering, the Royalite Oil Company has its gathering lines in the field and for the fifteen cents it gathers it and carries it to Calgary, which is a distance of approximately 40 miles. Now, it might be of interest to the Commission to know that at the last session of the Legislature an amendment was made to the Pipe-line Act. Prior to that amendment there was a power in the Lieutenant-Governor-in-Council to make regulations, among other things, fixing the pipe-line rate, but at the last session that was transferred to the Public Utilities Board and some months ago an application was made, - I am just mentioning this in passing, - some months ago an application was made to the Public Utilities Board by some of the producers in Turner

Valley to set about holding an Enquiry and establishing a rate for the carriage of crude from Turner Valley to Calgary. That application was pending when it was proposed to issue this Commission. Now, it would be quite out of the question to leave out of this Commission consideration the matter of arriving at a proper pipe-line rate because that is something which enters into the refiners' laid down cost of the crude, of course, and in turn it is an essential element in arriving at the price of the refined product, so it is obviously necessary to include in this Commission a direction to the Commission to proceed to find the proper pipe-line rate. Now, it is proposed to call an expert in to Alberta and to set him about the business of valuating this pipe-line. Then, there will be accountants who will have to go into the offices of the Royalite Oil Company, which I hope are in Calgary, but which may also be in Toronto, to examine the revenues and expenditures and the general capitalization, and everything which has to be properly examined in a case of this kind, and then those submissions will be made to the Commission and the people who make them offered for examination and cross-examination, and presumably Mr. Nolan will have some of his people come to tell us about the rate and to show why it should be fifteen cents, or perhaps something more. Now, there are some collateral matters which are mentioned in connection with the pipe-line rate, that is, as to whether or not the fact that the Royalite Oil Company which owns the pipe-line and, therefore, is the biggest purchaser of crude oil, whether that in any fashion operates against freedom of access to crude by others, others, those who are interested in having it or whether it in any sense tends to keep up the price.

THE CHAIRMAN: Will any question arise whether or not it would be economy to have the refining at the point at which the crude is produced and brought in in a refined article?

MR. FRAWLEY: I think that will probably arise. The expert who will come will probably come from the State of Texas and he will be in a position to offer some opinion with respect to that very matter. He will be a man who will have knowledge of refinery operations as well as pipe-line operations, although he will be particularly a pipe-line man, I imagine. There is in these same paragraphs a direction to inquire into the costs of carriage by other methods because some of the crude is trucked from Turner Valley to Calgary. Now, that brings up the question of the Saskatchewan Refinery, which I touched on a little just in passing this morning, and, as I say, one refinery at least has experienced some difficulty in obtaining the crude which it desired, and it does make the allegation, perhaps quite unfounded, because the major companies own the transportation facilities they find it difficult to get their supplies, and the kind of supplies they want. I think if that is found of enough importance I will bring that man from Regina to tell his story before the Commission if I think anything useful can be obtained from his evidence for the Commission information.

Then, perhaps, too, the question of these contracts will arise there, the contracts we were speaking of this morning, these production contracts which are entered into with the two largest purchasers, the Imperial Oil Company and the British American. As I say, some of these people, - to put it baldly, one anyway to my information, has not fulfilled his contract, has not carried out the contract he made to dispose of all of his product to the Imperial Oil Company, and I think we should examine into that.

There is very little more to be said about pipe-line costs because that is a matter of expert examination, both by the pipe-line man and by the accountants under the direction of Mr. Cottle.

Then we come to the matter of marketing costs, which perhaps, in the minds of the public, is the part of the Commission which bulks largest. When I say the marketing costs, my Lord, I mean the spread between the refinery door costs of the gasoline and the lowest tank wagon price or wholesale price. Now, the expression "refinery door cost", simply means the cost of the barrel of gasoline or the unit of gasoline after it has been made and is ready to be put into the truck to take it away to the dealer and when I say "tank wagon price" that is an expression which is used to indicate the wholesale price of a unit of gasoline when it is sold to the service station, or the dealer whoever he may be. Now, that is what is called "marketing cost" and I am here boldly to say that in my opinion those costs are excessive and that there should be some way of bringing, of reducing them, and it will be my effort to bring to this Commission evidence to support a submission that this spread between refinery door cost of the gasoline and the tank wagon price must be reduced.

Now, in this Province the marketing situation is not particularly complex, largely because of the fact that the only major refinery at the moment is the Imperial. The situation is comparatively simple, there are in the Province some nine hundred and twenty wholesale distributors' licences. I may say that there is in this Province a Fuel Oil Licensing Act which requires that every person operating a fuel oil business, and the word "fuel oil", by the way, in this Province, must be understood immediately, the word"fuel oil"

does not mean oil used to burn in a furnace, the word "fuel oil" has been taken to mean refined petroleum products, generally speaking, gasoline, distillate, tractor gasoline, all of those things are called "fuel oil" chiefly for the purpose of what is called the Fuel Oil Tax Act. In some Provinces it is called Gasoline Tax Act, but in this Province there is the Fuel Oil Tax Act pursuant to which everybody must obtain a license, whether he be distributing gasoline by wholesale or by retail. Now, there are in the Province of Alberta nine hundred and twenty wholesale outlets, wholesale outlets of one kind or another and I think I will just run over that list, or the biggest wholesalers in that list. Now, the list leads off, of course, with the Imperial Oil Company, operating two hundred and eighty-three wholesale outlets; The British American Company with two hundred and nine outlets; the Great West Distributors operated by one MacKenzie in Calgary with one hundred and twenty-seven outlets; the North Star Oil Company of Winnipeg with eight-seven outlets; the Maple Leaf Petroleum Company, a wholly owned Imperial subsidiary, ninety-six outlets; the Texas Company, seventeen outlets; the Artic Company, twelve outlets; the Gas and Oil Products of Calgary, eleven wholesale outlets; the Lion Company of Calgary, seven; the Union Oil Company of Canada, which operates only in a small way in this Province, five outlets, and the McCall Frontenac Company, a large Eastern Company but a small operation in Alberta; two wholesale outlets, and then there are some smaller ones, making a total of nine hundred and twenty. Those are the number of outlets. There are seven hundred wholesalers in the Province, licensed wholesalers, so you see from that that there are a great many people who operate in a very small way with only one outlet.

In fact, there are twenty-six wholesale distributors operating only one outlet each.

Now, the gallonage. When I said that the matter of the marketing of gasoline in this Province was comparatively simple I had chiefly in mind the manner in which the gallonage was divided and the figures which I am about to give you are interesting in indicating the fact that the great majority of business in Alberta is shared by two companies. Now, in 1938, from the beginning of the year to the end of June, 47½% of all the gallonage originated with the Imperial Oil Company. Now, to understand that, I should say that the Imperial Oil Company has two departments, one might say. It has its own marketing department where it sells gasoline to its own agents all over Alberta and that gasoline is sent out to its own agents, its own wholesale outlets, its own wholesale agents. That gasoline finds its way into the market through dealers and service stations who buy from these wholesale Imperial outlets. That is what is called the marketing department of the Imperial Oil Company but then a great deal of the gallonage of the Imperial Oil Company is disposed of in another way, it is disposed of by making contracts with people who are called "jobbers" and a great deal of gasoline is sold that way. The people, the biggest of the jobbers who buy in that way by special contract from the Imperial Oil Company, are the North Star Oil Company, that is a company which is purely a marketing company in this Province. It has a refinery, not a very large one, in Manitoba, in Winnipeg, but throughout Western Canada, except what it refines itself it buys all of its products from the Imperial Oil Company, There will be a considerable amount of evidence submitted to the Commission about the North Star Oil Company,

I mean just as to what it is and the nature of its relations with the Imperial Oil, the nature of its contract, the price, of course, at which it buys gasoline and so on. Then next in importance, perhaps, - perhaps of as much importance, - is the Maple Leaf Petroleum Limited, that is a wholly owned Imperial subsidiary which markets gasoline throughout Alberta. That company in turn has made a marketing arrangement with the U. F. A., and between the two of them they operate ninety-six wholesale outlets. That is again Imperial Oil gallonage.

The McCall Frontenac Company buys all of its products in Alberta from the Imperial Oil Company. The Union Oil Company of Canada buys all of its products from the Imperial Oil Company under one of these jobbers' contracts. They until fairly recently bought their gasoline from Ioco, from Vancouver, they bought crude oil from California, turned it over to the Imperial Oil Company, and had it refined for them and then they brought it across the mountains to Edmonton where it was distributed throughout Alberta. That operation has been discontinued and the Union Oil Company buys its products from the Imperial Oil Company. The Canadian Oil Companies Limited operates thirteen service stations and is quite a sizeable marketer in this Province. I should say it operates thirteen bulk stations, and that company, the Canadian Oil Companies Limited, it purchases all of its requirements from the Imperial Oil Company. Now, that explains what I meant when I said forty-seven and a half per cent of all the gallonage sold in Alberta in the year 1938, to the end of June, originated with the Imperial Oil Company.

Then the British American Oil Company, twenty-seven percent of all the gallonage in that period originated

with the British American Oil Company and that was taken care of by what they sold themselves to their own wholesale outlets and what they sold in the same way to j bers because the British American Oil Company similarly has jobbing contracts, the biggest one with them being Mr. MacKenzie, the Great West Distributors. Mr. MacKenzie operates one hundred and twenty-seven wholesale outlets. He buys that gasoline from the British American Oil Company. His operation is interesting and I propose to present an audit and an investigation of his cost, because he is a pure marketer. He buys from the British American Oil Company at so many cents under tank wagon; in other words, it is just as simple as this, the posted tank wagon price in the City of Calgary is 16.5 cents. Every tank car of gasoline which Mr. MacKenzie buys from the British American Oil Company for delivery in Calgary, he pays for that 16½ cents less something, less a certain number of cents, and he, therefore, operates on that margin, as it is called, of so many cents under tank wagon. It will be interesting to see whether or not Mr. MacKenzie is able to buy gasoline from the British American Oil Company and sell it to the public, to the consumer, at a profit, or at a loss.

The Gas & Oil Products, then, of course, we drop down very rapidly, we have 45½% Imperial, 27% British America, and then the Gas and Oil Products 6.4%, the Lion Company, 3%. Then, all other distributors, except the importers, account for 2.7%. Now, when we come to what is imported, we find that it is 13.4%. In other words, there is still in this Province being sold almost 13⅓% of all the gallonage, which comes in from the State of Montana. Of course,

the great bulk of that is what the Texas Company brings in.

There is another interesting calculation which has been made, which is the number of licences which have been issued. There are in Alberta two thousand and twenty-five licences, retail licences, and I find that 90.16% of all those retail outlets are supplied by twelve companies, these being the twelve companies, the Imperial, British American, North Star, Texas, Great West Distributors, Canadian Oils, Maple Leaf, Union Oil, Artic,Oil, Bell Refining, which is a B.A., Gas & Oil Products and Lion Oil. 90.16% of all of the retail licences are supplied by these twelve companies and I find this, that 54% of all those retail outlets are supplied by two companies, these two companies, of course, being the Imperial Oil Company and the British American.

Now, I have gone into these figures just so that the Commission will be aware at the outset that this gasoline business in Alberta is concentrated into the hands of what is called, in common parlance, the major companies, and I say the costs are excessive and the question is how to go about endeavouring to find out. Well, we will examine the marketing costs of the Imperial Oil Company and the British American Oil Company primarily because they, - I say primarily the Imperial Oil again, - because the price is fixed by the Imperial Oil Company, which prevails in the Province to-day, and these marketing costs, as distinguished now from the refining costs, which we talked about briefly this morning, these marketing costs will be carefully analyzed and scrutinized under Mr. Cottle's direction. That will have to be done in Toronto and in Sarnia, I rather think, although I had a rather encouraging telegram from the comptroller of the British

American Oil Company, I do not think he really means what I take out of the telegram. He said he couldn't be here himself but he was having Mr. Eric L. Harvie to represent the Company. He said

> "Impossible for a representative from Toronto to be present at opening session of the Commission. Mr. Eric L. Harvie of Calgary will represent us. To facilitate work of Commission we shall be glad to make available the information you may require at Calgary."

I only hope that that is true, but I do not think that he means just that. However, if it has to be done it will be done and the marketing costs will be examined to ascertain one or two things, my Lord, are excessive profits being made and is that what accounts for the spread between the refining door price and the tank price, or is too much money being spent, - and I have no hesitation in saying that certainly on the cost sheets which I have seen it would appear to be the latter, - that too much money is being spent on marketing gasoline in the Province of Alberta. Hundreds of thousands of dollars are shown under the heading "marketing costs". Now, in the marketing costs again we have, under the general heading of marketing, we have marketing costs which would be the costs of maintaining the many, many bulk stations, commissions paid to the agents for marketing and delivering the goods and then depreciation and general administration again comes in and these have to be carefully scrutinized and I would simply call your attention again to the direction in the Commission, to the

authority in the Commission, that if you find anything which is not in your opinion necessary or reasonably required in connection with marketing costs, and this appears as one of the things that the Commission has to enquire into,

> "whether any plant, equipment or other investment of any kind now used in the distribution and marketing of petroleum products in the said Province whether by wholesale or by retail is or is not in the opinion of the said Commission reasonably required for the purpose of adequately distributing and marketing petroleum products in the said Province, and should or should not in his opinion be taken into account in arriving at fair and equitable prices to be charged by wholesale or by retail for petroleum products in the Province".

I am speaking of the wholesale at the moment. In other words, if this Commission finds that there are literally too many, the Imperial Oil Company and the British American Company and all of them, have too many wholesale outlets, then it will be my submission to the Commission that they can keep their wholesale outlets as they choose, but as against the price of gasoline they must be thrown out. They can keep the bulk stations if they choose and charge them in some other place but in the cost which they will submit to this Commission they should not appear. There should only be shown the number of outlets and such expenditures in the maintenance of those outlets as is reasonably required to adequately service the people of the Province. Now, it is a large task, there is no question about that. The situation has grown up as a result of

intensive and unrestricted competition. There has been no limit what ever to whether or not any of these companies shall or shall not go into a town to set up a wholesale outlet and I have taken the trouble to, just purely by way of example, to show how many outlets there are in some of these little country places, and I would like to give your lordship those figures. I ask the licensing branch to just at random pick the following towns and tell me the number of wholesale outlets there were and this is what I find; in Wetaskiwin there are one, two, three, four, five, six, seven, seven companies operating, the Artic Oil Company, the Associated Distributors Li ited, that is an Edmonton company purchasing from the Gas & Oil Products, the Associated Distributors Limited, the British American Oil Company, The Great West Distributors, the Imperial Oil, the Maple Leaf Petroleum, you see you have there the Imperial O l, it is a wholly owned subsidiary, the Maple Leaf and the North Star Oil Company. Those are the six large distributors, you might call them, and then we have another one, which is George W. Wilson.

In Camrose, the British American Oil, the Canadian Oil Company, the Imperial Oil, the Maple Leaf, the North Star Oil, the Texas Company of Canada and Otto R. Brager.

Now, when we stop to remember, and I think this is worth remembering, take the town of Camrose, the British American, the Canadian Oil, the Imperial Oil, the Maple Leaf, the North Star and the Texas Company, all of that gasoline, all of it except the Texas Company gasoline, is coming out of the East Calgary refinery, the Imperial Oil

Company refinery, the British American is taking theirs from that refinery and selling it under its own name and then the Canadian Oil Company under its jobbing contract with the Imperial is taking it all from the East Calgary refinery, the Imperial. The Imperial Oil is there too, and the Maple Leaf, its wholly owned subsidiary, taking its gasoline from the East Calgary Imperial refinery. The North Star Oil Company under its jobbing contract takes its gasoline from the East Calgary refinery and it is there too and the Texas Company of Canada is there bringing its gasoline from Sunburst, Montana. Where Mr. Brager gets his gasoline I am not aware.

In Lethbridge, we have the Artic Oil sales, the British American, the Canadian Oil Company, the Gas & Oil Products, the Great West Distributors, Roger Hedenstrom, the Imperial Oil, the Huff Refining, the Maple Leaf Petroleum, the Northern Light Refinery, the North Star Oil, J. Oswald and the 77 Oil Company. Now, those are all people with wholesale outlets to serve, - well now, perhaps, I should stop there, - to serve a well limited area because one would not need to go very far East nor South nor West of Lethbridge to find another group of wholesale outlets in the nearest town on the railway to Lethbridge.

In Red Deer, the British American, the Canadian Oil Company, the Great West Distributors, the Imperial Oil, the North Star Oil, the Texas Company, Percival B. Jarvis, C. H. Macklin, Fred H. Pixley and Thomas W. Mayberry.

In Vulcan, the British American Oil Company, the Canadian Oil Company, the Gas & Oil Products, the Great West Distributors, the Imperial Oil, the Maple Leaf, the North Star Oil, the Texas Company of Canada,

In Grande Prairie we find the British American Oil, the Imperial Oil, the Union Oil Company of Canada and the Maple Leaf Petroleum.

Now, I need not go any further. I picked out six or seven but this is the same thing running throughout the whole Province. Now, I propose to do this, to select a certain piece of the Province and endeavour to start with, purely for geographical purposes, to get a large scale map, perhaps a municipal district or two or three municipal districts, perhaps taking in two or three with perhaps only two or three points where the bulk stations are located and then to show the duplication, to actually show the duplications, to show that the Imperial Oil Company is sending out its trucks to supply gasoline to farmers A,B and C; the British American Oil Company is sending out its trucks to supply farmers D,E and F, who are probably stationed or living right on the same section, perhaps, or two sections, as the farmers A,B and C. That has to do with supplying the farmers, the consumer, because as your lordship may know, the farming trade is supplied from these wholesale outlets. Farmers buy their gasoline at the same price as the service stations buy it, that is they buy it at wholesale, but in addition to the farmers we have the service stations and the garages in the same towns and the same duplication there. We have one garage being serviced by the Imperial Oil Company and a service station next door being serviced by the British American Oil Company, or it may be the Great West Distributors or the North Star. Now, as I say, I propose to examine and go into the offices of these companies, all of these companies, for that matter, to show this excessive duplication, and then, as I see it now, there will be a

submission to the Commission that there is too much investment along that line and I will endeavour to avail myself of these paragraphs in the Commission which gives the Commission the right of arbitrarily, if you like, throw out from consideration, eliminate from consideration, the excessive duplicate investment in this marketing structure.

Now, there is something just there which, perhaps, is worth while speaking of for a moment. The Imperial Company's marketing structure consists of the wholesale marketing structure, consists of establishing at many, many points throughout Alberta, I have given you the number, - two hundred and eighty-three points, to be exact,- establishing at those points what are called "wholesale outlets". That wholesale outlet, in the Imperial Oil structure, is two or three tanks above ground called "vertical storage", that is situated on the right-of-way accessible to the railway company. There is no retail distribution from that wholesale outlet whatever. It is used exclusively for delivering by truck from those tanks to farmers or to garages and service stations. There is no retail distribution, I say again, there. That is the Imperial Oil marketing structure. Some of the other companies, of the Great West Distributors, as an example, operate what they call "combination outlets". There will be bulk storage and at and in the same premises and on the same acreage, say two pumps for vending gasoline, so that obviously a certain amount, a great deal of overhead, is thereby eliminated. The economics of these combination outlets will be examined, we will endeavour to find out whether or not that is the way to market gasoline in the Province of Alberta insofar as getting down costs is concerned.

Now, it is not just as easy as it sounds because there are such things as fire by-laws, and insurance

regulations, but in any event we will certainly direct ourselves to a very careful consideration of what can be gained by using the combination outlet where there can be a wholesale and retail distribution from the same premises, and whether or not that is where we must work and the avenue we must follow in endeavouring to reduce the present excessive cost of marketing.

Then, another thing that must be explored is what is the effect of these big jobbing contracts on the price of gasoline. Why should the North Star Oil Company, - just putting it baldly, - why should the North Star Oil Company be permitted to buy gasoline from the Imperial Oil Company at so many cents under tank waggon. Let me put it this way, it is, I will put it this way, it is detrimental to the consumer if the Imperial Oil Company has to charge sufficient on its marketing of gasoline, - and that is an expression which we will get to know better, what they call their marketing gasoline, it is what they themselves market through their wholesale outlets. What they call "jobbing gasoline" is what they sell under these special contracts with these other companies. Now, it is detrimental to the consumer if the Imperial has to charge sufficient on its marketing gasoline to make up for losses suffered on jobbing gasoline, on the gasoline which is sold to these jobbers at a low enough price to enable the jobber to make a profit, because the North Star Oil Company presumably gets a sufficiently large spread from the Imperial to enable it, the North Star, which is purely a marketer, to carry on at a profit, and if to enable them to sell that gasoline to the North Star to sell at a profit, they, the Imperial, have got to charge more to their marketing organizations, - and mind you it is the

Imperial marketing organization which fixes the price, it is there that the price is set, - and if they have to charge or keep that price up to take care of the low price which they have given to the North Star, to the Canadian Oil Company, to the Union Oil Company and the Maple Leaf Oil Company and so on, then I say that is just detrimental to the consumer and then I will be bold enough to suggest to the Commission that that system of distributing gasoline be changed and that the Imperial Oil Company should market its own gasoline, if it can be done more economically then the Imperial Oil should market its own gasoline.

Now, as I say, these remarks, these statements made in opening, are what they pretend to be, suggestions made in opening and we will have to explore these things. I may say we have, Mr. Cottle and I, have explored them only to a very limited extent in the Tariff Board Enquiry. We discussed the North Star in the Tariff Board Enquiry and we will do that much more completely and with a much more consistent follow-up in this Enquiry.

Then continuing what I said, if, in addition to finding that the Imperial must charge more in their marketing department, if we find that some of these jobbers are not operating at a profit but operating at a loss, if we should find that, then it does seem to me it is almost self-evident that continuing to sell to that particular jobber at that low price is not in the best interests of the consumer. Now, that is all I have to say about these large jobbing contracts. Do they matter or do they not matter? Are they detrimental or are they beneficial? Is there anything in the fact that they are there for competition?

At the moment I have no concluded view about it but I throw these out as suggested avenues of enquiry which will be undertaken by us.

Then we pass to another item in this marketing cost and that is the retail cost because that has to be gone into too. Now, the retail cost is the spread between what the service station buys it for and what he sells it for. There is one prevailing practice in the gasoline industry in Alberta and that is that there is what they call the posted tank waggon price. Retailers of gasoline buy at posted tank waggon prices ordinarily, that is what the price is posted for, it is to indicate the price at which gasoline can be purchased by people who intend to resell it and that price to-day in Calgary is 16½¢. The reason I keep referring to Calgary is that everything else in Alberta except in the far South is Calgary plus freight. Edmonton is 19½¢, that is just three cents over Calgary and that represents just exactly freight and Red Deer is half way, let us see what Red Deer is, Red Deer is 18.7. It is about half. Calgary is 16.5. Red Deer 18.7. Edmonton 19.5. That gives you an idea of the rise. Now, that is What is called the posted tank waggon price but, of course, not very much gasoline is purchased by dealers at that price, the posted tank waggon price, because all of the companies have what they call an exclusive retailers' contract and if you are a retailer and you have any sense at all you will buy all of your products from one supplier, you will buy all of your products say from the Imperial and if you do you get that gasoline for 15½¢. You get one cent off the posted waggon price if you confine your purchases to the one company and this goes for all of them. If you want to buy from the

B. A. you get it one cent off. From the Great West, from the North Star, from all of them.

Now, the spread, that must be explained when we begin to talk about spread. The price of this 16½¢ gallon in Calgary to-day is 16½ plus 3½. In other words, what is sometimes called the "canopy spread" in Calgary to-day is 3½¢. That makes the gasoline 20¢ to the consumer. In other words, the consumer in Calgary to-day is paying 16½¢ plus 3½ for 20¢ for a gallon of regular gasoline. The spread, therefore, is, you see, 3½¢, but that is only a nominal spread, because if the dealer from whom you buy, if the service station from whom you buy, is a 100% dealer, as he is called, then he is buying at 15½¢. Then his spread is, of course, 4½¢, so when we talk about retail spreads, and whether they are big enough or not big enough, what we have in mind then for the City of Calgary is that the service station is getting along and selling gasoline at 4½¢ spread. Now, there is not any uniformity peculiarly enough in these retail spreads. In the City of Edmonton it is 3¢. In the City of Edmonton regular gasoline sells for 10.5, plus 3, 22½¢, for regular gasoline in Edmonton to-day. In other words, that, of course, becomes 4 because he buys it at 19.5 less 1 if he is a 100% dealer. Of course, all of these quotations I am giving you are exclusive of the Provincial fuel oil tax of 7¢.

Now, the spread in the various Provinces, in the various cities of Canada, are these, in Vancouver the spread is 4¢. Now, I am speaking about the spread between the posted tank waggon price and the service station price. Well, if they had the same arrangement there for 1¢ off to the 100% dealer it means in Vancouver the retailer

is getting 5¢ to turn over a gallon of gasoline. In Calgary 3½¢ becomes 4½ to the 100% dealer. In Edmonton 3¢, which becomes 4. In Regina 3¢. In Saskatoon 3¢. In Winnipeg 3¢. In Ottawa 2½¢. In Toronto 2½¢. In Montreal 2½¢ and in Halifax 4¢.

Now, before I leave the question of spreads in the Province of Alberta, there are almost as many spreads as there are towns and villages in it. I was not aware until fairly recently that there apparently is no control whatever by the oil companies on the retail spread of gasoline. In Pincher Creek to-day gasoline is selling for six and a fraction cents, I mean the retail spread there is 6½¢. In Red Deer, in a marketing centre the size of Red Deer, it was 6.1¢ until a month or so ago, a very few months ago, when just by having it called rather forcibly to the oil companies' attention they went in there and must dropped the price down to about five something, but in Red Deer to-day it is still five and something.

Now, that has got to be gone into because that may mean that there are people in the retail gasoline distribution who are inefficient, who are sub-marginal, so we propose to investigate a select number of retailers. We will take a large retailer like Loveseth in Edmonton who is perhaps one of the largest that there is in Alberta. There are some dealers in Calgary as large. We will examine his marketing costs, his cost, find out if he is making money or losing money on the 4¢ spread. Then we will examine some of the smaller ones and some of the medium sized ones and we will also find out whether there is anything in the story that

inefficient dealers are sometimes subsidized by the oil company. If a dealer is not doing very well I am told that he will be subsidized by the oil company to keep him going to keep the outlet open during the dull season. For instance, in the Winter time, if his gallonage goes down to the point where he cannot make enough revenue on his 4¢, then the Imperial Oil, or whatever the company is, the marketer will pay that service station operator a salary or subsidize him in some fashion. Why? To keep the outlet open. It may be they own the premises and have to keep a certain amount og gallonage going through it. Now, that could not be, that subsidizing could not take place, if the spread which the markoter gets between refinery door prices and tank waggon prices were reduced. In other words, that spread, it seems to follow that that spread must be enough to enable him to subsidize these inefficient dealers. In other words, just as a practical illustration, supposing the Imperial Oil Company was about to close a service station up because it was not profitable to operate. I know perfectly well that the first question which comes to one's mind is would the Texas Company or some other marketer, that is going ahead rapidly or spending a lot of money to advertise, would they go in and take over that station and, of course, if they would, then the Imperial Oil cannot let it go, and cannot close it up and so they must keep on with that inefficient outlet and when the slack season comes the question is, do they subsidize those dealers and the only interest I have in that is, are they able to do

that because of the spread which they take between refinery door costs and tank waggon prices and if we find that they are doing that and we find that that is being charged up against us in these costs then we will be bold to ask the Commission to eliminate that and in that fashion to narrow the spread. So much for the retail costs. If there are too many people retailing gasoline in Alberta and it is coming out of the consumer then probably the number of retailers should be reduced so that only those people who are efficiently marketing and who have enough gallonage flowing through the outlet would be continued in the business. At the moment I am only concerned chiefly with the price of gasoline to the consumer and we will be told to close up might mean a certain amount of unemployment, but that is a question which has to be faced, so so far as I am concerned it is the greatest good to the greatest number of people.

Now, I pass to consider the position of the Ethyl corporation in the Province of Alberta and that appears in paragraph (f of the Commission.

"the operation of the Ethyl Corporation in this Province and the effect of the licensing system of the said Corporation upon the refining, distributing and marketing of petroleum products in the said Province."

Now, I want to explain, perhaps in a word in my amateurish way what this business of Ethyl and Ethylized gasoline is. We take the Imperial Oil operation in East Calgary as as good an illustration as any. The Imperial Oil Company in East Calgary takes

crude oil and makes straight run gasoline from it, That is by a simple distillation process they obtain what they call "straight run gasoline". That is the first product, the natural product of the distillation and that is called "straight run gasoline." Then they take what is left of the gasoline, the bottoms, and run it through cracking stills, and that is submitting it to excessive heat, the great heat, that is called "cracking gasoline". Then they have a blend then of straight run gasoline and cracked gasoline. They blend that and that resulting product of cracked gasoline and straight run gasoline will have an octane number of about 60, and when I say "octane number" that is, I will have to call it that, that is the thing in the gasoline which takes care of the modern high compression engine. Now, there is no lead. There is nothing done to this gasoline at all, it is straight run and cracked gasoline which has an octane number of about 60. Then the refiner adds Tetraethyl lead which they buy from the Ethyl Corporation which is a Deleware corporation, operating in Wilmington, Deleware, and manufactures this Ethyl lead. The refiner then takes about two cubic centimeters of this Tetraethyl lead and adds it to this blend of straight run and cracked gasoline which has an octane of about 60 and this lead added brings that gasoline up to 70 octane. In other words, that is how simple it is to make standard gasoline out of a blend of straight run and cracked gasoline.

Now, that standard gasoline, that regular gasoline, can be made by intensive cracking without any lead at all, but that would be more expensive and my

information is, and it will be the evidence led because Mr. C. J. McFarlane is the resident representative of this Ethyl Corporation and we are very fortunate in having him living in Calgary instead of elsewhere and he is a very accommodating gentleman and he will come here and tell us what Ethylized gasoline is and how it is made. I am only giving it to you now very generally but the point I am making is this, this is standard gasoline, this is regular gasoline I am talking about, not the premium red gasoline which is called "Ethyl". Now, there are only two ways of making that 70 octane one by buying from McFarlane lead and adding it and the other by intensive cracking. Then I say the Ethyl gasoline corporation controls the manufacture and sale of regular gasoline in this Province, and I may say throughout the whole of Canada, but I say in this Province. Now, there has been some question in this Province as to the right of the small refinery to make this regular gasoline. At the moment the smaller refineries cannot make regular gasoline, that is literally so, without the help of the Ethyl Corporation. Mr. Mayland or Mr. Plotkins of the Lion Company, the small refinery, cannot, they have not the equipment to intensively crack crude oil and make it 70 octane. They must have a license from Mr. McFarlane to buy the lead and mix the lead with the gasoline and those contracts will be submitted to you, showing the requirements of the Ethyl Corporation, because some people think they are onerous. I am not going to say they are onerous at the moment but if they are onerous, so far as the Ethyl Corporation is concerned, they are required to be so

because of safety factors. This Ethyl lead is a product which is dangerous to health if not handled carefully and the restrictions placed on the handling of this product by the corporation have to do with the safety factor. The Ethyl gasoline corporation is an essential element in our marketing picture and that is why their operations will be brought to your attention. Then there is a premium on Ethyl gasoline in this Province of 2½¢. It is not always 2½¢, that is, it is not everywhere 2½¢ but there is a premium of 2½¢ between regular gasoline of 70 octane and Ethyl gasoline of 76 octane and we will enquire into whether or not that 2½¢ is justified. That is no business of the Ethyl Gasoline Corporation. That price is fixed by the refiner himself and the marketer.

Now, there is the matter of the jobbing contract which I will discuss for a moment. We will submit those contracts. We will demonstrate to the Commission, but before that I might mention that appears in "g" of the Commission, which is

> "The price and/or cost of petroleum products sold to jobbers and dealers in the said Province and the factors which enter into the determination of the said price and/or cost and what the fair and equitable price and/or cost of petroleum products sold to jobbers and dealers in the said Province should be."

I have said something about these jobbing contracts a moment ago and need say very little now. The Imperial jobbing contracts are with the North Star,

the Canadian Oil, the McCall Frontenac, the Union and the Maple Leaf. The British American contracts are the Great West and its own subsidiary, the Bell Company. The contracts call for the delivery of gasoline to those jobbers at so many cents under tank waggon at destination. That is the general way that they run. They will be examined and we will see whether or not there is any detriment to the consumer in maintaining those contracts.

Then there is the question of consumers' contracts, because the fact is that many consumers in the Province of Alberta purchase gasoline at wholesale prices from the oil company. In other words, if you are a wholesale grocer and you have two or three trucks you can go to the oil company and get a pump from them, put the pump in the back yard of the warehouse and serve yourself, service your own truck, and perhaps with some saving, doubtlessly some saving on your gasoline costs. These wholesale grocers and the like are sold their gasoline at posted tank wagon less one cent. In other words, they are sold at the same price as if they were 100% dealers, retailers. In other words, the situation there is, - and I am not saying for the moment it is fair or unfair, the situation there is if I am a service station man selling gasoline, retailing gasoline and making my living thereby, and Mr. Smith, my friend, is a wholesale grocer who has three or four trucks, Mr. Smith can buy his gasoline at the same price at which I can buy it and that is that. The only criticism which might be offered about that is

that it takes gallonage away from where it otherwise might be, namely, of the retail station. Of course, the answer to that is that the wholesale grocer and packing plant and so on, buy anything they buy and everything they use at wholesale and they probably think that, - and the oil companies have so far agreed with them, that they should buy it wholesale.

Now, I only have one or two more points to discuss and that is the fixing of the price and how it comes about that the price is fixed, in Calgary to-day, at 16½¢. That, in a word, is what the Commission has to do, but I propose and perhaps can tell you of the experience that we have had with the oil companies to date in discussing that price. If you ask the marketing vice-president of the Imperial Oil Company why the price of gasoline in Alberta to-day has been fixed by his company at 16½¢, or 15½¢ is really what he gets for it from nearly everybody, he will say that is fixed by the cost and competition.

THE Chairman; Costs and what?

MR. FRAWLEY; And competition. That has been the universal answer which I have obtained from Mr. Halverson, the vice-president in charge of marketing for the Imperial Oil Company over a good many months. I am just told that Mr. Halverson is not a vice-president, he is a director, but he seems to be the gentleman who knows most about the price in any event. Now, I propose to ask Mr. Halverson, because he, of course, at some time or other, will come before the Commission and give evidence, and I propose to ask him to break down that

price of 16.5. I think this Commission can accomplish nothing until it first knows why the price is 16½¢. Why is it not 19½¢ or why is it not 12½¢? Why is it just 16½¢? Now, that is the only important price in the Province of Alberta to-day because all other prices are "Calgary plus freight", so our whole Enquiry upon price is going to centre around 16½¢, which is the posted wholesale price of gasoline in Calgary to-day, and I intend to pursue that, not so much myself, but Mr. Cottle will pursue that, and he will endeavour to find out, my job will not be finished when we do find out, but we will endeavour to find out just why that is 16½¢. We will even ask them to produce their working papers and the members of the staff that actually worked it out.

Now, then, not to repeat what I have said, we will endeavour to ascertain if there are in the refining of petroleum in this Province andin the marketing of petroleum products in this Province either by wholesale or by retail, any expenditure, to use the language of the Commission, any expenditure which is wholly or partially unnecessary or which is not essential or is not in the public interest, and if we find any of those things in either refining costs or in marketing costs we will ask the Commission to disregard them in arriving at the fair and equitable price to be paid for gasoline.

Now, there is only one other item I need to touch on and perhaps it is not even necessary to touch on it. There is an item in the Commission which asks the Commission to report to the Lieutenant-Governor-in-Council the advantages or the disadvantages to the

people of the Province in the Government of the Province taking over the wholesale and retail distribution of oil in the Province, but all I can say about that is that by the time the Commission is finished listening to what little I have to say and the great deal that Mr. Nolan and his people will have to say, that then they will be, they will have acquired such knowledge of this industry that they can very intelligently set down for the information of the Lieutenant-Governor-in-Council the advantages, if any, and the disadvantages, if any, of the Government taking over the distribution of this business.

MR. SMITH: I have nothing to say, sir, except on behalf of my clients, we can assure the Commission that our books and our staff and everything we have is open and available at any convenient time for the Commission or my learned friend or his assistant in order that we may intelligently render whatever assistance we can.

MR. NOLAN: My lord, I understand that my friend Mr. Frawley sent a letter last week to my client, to which he has not yet received a reply, but I am quite sure that all these details and the methods of getting at this evidence can be worked out between Mr. Frawley and myself and the officials of my company. I was under the impression, sir, that to-day we would adjourn for a certain length of time in order that these investigations, valuations and examinations of the books could be carried out. I take it, sir, that you will give us some indication of the length of time that that adjournment shall last because it is important to us in that after the

examinations and valuations and investigations have been made we should have an opportunity of making ourselves ready to answer the conclusions to which the examiners and investigators and valuators have come. It seems to me, sir, it is going to be a very long job. From what Mr. Frawley has told us to-day I am quite sure that Mr. Cottle alone, or assisted as he may be, will require a long time to make the investigation which he, I understand, proposes to make with particularity and which we have been informed that he is going to make, and I am sure before we leave to-day we will be given some knowledge of how long the adjournment will be.

MR. HARVIE: My client is only too willing and anxious to co-operate in every way and I think the intimation given Mr. Frawley in the wire is correct, possibly so far as it goes, any information that can be sup lied in Calgary or at his request will be supplied here. I think it will be only in such a case where there might be some doubt as to the accuracy of that information supplied that there would be any need for Mr. Cottle or any person also to go ouside Calgary to examine into it, but if that situation should arise I am satisfied they will get the co-operation of our company in everyway possible. I agree with Mr. Nolan that it is essential that we get some kind of picture of just what is apt to develop by way of the procedure to be adopted. If there is going to be a questionnaire to each of the companies of what we are requested to answer, so far as my company is concerned we will answer it as rapidly as possible, but it does take time and then once that is broken down

and further investigation made in connection with the information given we would like an opportunity of surveying those recommendations so that we can make our reply and in that way facilitate the duty of the Commission and see that possibly there is no inaccurate information placed before you, and by that I mean no criticism of Mr. Cottle, because we have found him very accurate, painstaking and careful, but it is a very complicated matter and neither he nor anyone else could possibly get all that lengthy interpretation of figures and facts,

MR. FRAWLEY: It might be useful if I indicated what is in my mind as to the nature of the investigation and how soon they might be undertaken. As I see it, sir, there will be a number of investigations which may be carried on simultaneously. That will mean, of course, having enough expert assistance to do the job but I take it that the Imperial cost can be done and at the same time, and by another man, the British American costs. I will not say as to that because as to those two sets of costs I certainly want to have Mr. Cottle's own personal examination, and that might not be possible to have these two things done at once, but take the Great West Distributors, if we want to examine the Great West Distributors'set-up as being a man who buys so much under tank waggon and sells, that can be got under way at once and when that was completed we might, perhaps, have a public sitting to deal with that matter, we might examine into that particular phase. Take the pipe-line costs, that is a matter which can be put off into one department and investigated and reported upon.

It is very difficult to say how soon anything will be ready for submission to the Commission for examination and cross-examination but I am inclined to think probably if we adjourn now for, it is very difficult to say, of course, but there is no need of adjourning for a week and coming here and having nothing to talk about and I am only trying as intelligently as I can to gauge the time which will be taken before any one of these five or six independent examinations can be completed, and it is running in my mind that the Commission could perhaps, adjourn for thirty days, or something of that sort.

THE CHAIRMAN: Mr. Frawley, arising out of what Mr. Smith had to say this morning about you informing him or informing his company and the same, I suppose, would apply with the companies represented by counsel around the table, as to what your results were in order that they might make such reply as seemed proper, my fellow Commissioner made a suggestion which seems to me of some importance, that perhaps the starting point is for all of the companies with whom you are concerned putting their cards on the table, and since we only want to arrive at proof, show how they arrive at those various costs, you could then have those checked by Mr. Cottle and those others whom he may employ, as disyinguished from the making of an original accounting on his own behalf. It might be a great saving of time, and the companies might be very happy to do it. They, of all people, know what their costs are and how they are arrived at; perhaps if you were to indicate precisely

what you want to know that would be furnished to you in such form as a chartered accountant would understand precisely what was meant, and then you, perhaps, in less time would be able to check, and then having checked in turn inform the company, what the conclusions are, and you could then examine them with respect to the things you think are wrong. Then, perhaps, when we arrive here we might proceed with the evidence and it would be a question of the weight of the evidence and the importance to attach to this and that, rather than a searching expedition.

MR. FRAWLEY: May I say to that, Mr. Cottle has been through this before, certainly with the Imperial Oil Company, and I think you have to understand what is involved in one of these excursions by Mr. Cottle before one can discuss it very intelligently. He will be working side by side with the, certainly the chief accountant in the case of the Imperial Oil Company it is one James McGraw, he works side by side with that gentleman, and Mr. McGraw knows as Mr. Cottle goes along, because of the nature of the things that he is asking, and the nature of the objections he is making, pretty well the nature of his submissions to this Commission, and so there will be nothing secretive about it. He will take pains to keep Mr. McGraw informed. It is something of that sort which will have to be developed. Mr. Cottle does not audit the books of the company. Mr. Cottle takes the huge mass of figures and checks them and picks out, which I am expressing very roughly and

perhaps inaccurately, the things which should not be there, and he talks about those, and then to find them and to relate them to the Alberta picture is a task of no mean size, to find them and to intelligently fit them together and make a submission of them which is Mr. Cottle's job. He is not going to endeavour to audit the marketing system, for instance, of the Imperial Oil. He is goin to endeavour to analyze those costs, perhaps in a critical way, using that word in a very broad sense, and then come to this Commission with some finding. There will be no secrecy about what those submissions are because of the way we have to work so closely with the Imperial accounting executive and the accountants as he proceeds. Now, if I have not expressed clearly enough to the Commission what I mean Mr. Cottle might amplify it.

MR. COTTLE: My lord, Mr. Frawley has put it quite clearly except to say that any findings I might come to would naturally be discussed with the officials and the executives of the companies that I am concerned with before I make any statement, because I would find it quite necessary to do that to satisfy myself as to the accuracy of my own statements.

THE CHAIRMAN: Have you anything to add, Gentlemen?

MR. SMITH: Perhaps I might suggest, you see I am not greatly concerned, not directly concerned, is a better way of putting it, in the marketing and transporting. The Association that I represent is largely concerned with producing, I was wondering what contribution we could immediately make to this hearing

and the only thing that had occurred to me is that, confining ourselves, perhaps, well not confining ourselves to Turner Valley, although Turner Valley is, perhaps, the only productive, that is commercially producing field of any consequence as yet developed in this Province, I had thought it might be of interest to you to give you a compilation of the moneys which have been expended in the search for oil and the moneys which have been returned from the oil or gas. I am very sincere in saying I am trying to be of assistance because it seems to me that is something which you will have to take into your consideration in finding whether or not this $1.20 or whatever the price is, is a reasonable price. Let me put it shortly, the people who have invested money in oil in Alberta, and like mining undertakings, they are called hazardous, we have not yet even begun to get back the actual cash invested. Now, if figures of that sort would be interesting that is something I could have my people doing for the Commission right away, or if there is any other contribution I can make in order to get them towork while these other investigations are going on I wouldbe very glad to have suggestions from any one, whether or not I may be able to help. I thought that might be of some interest to you and I was going to put that under way at once. You see, we are a new organization. We have a secretary and some staff and we can put them to work doing any of these things that might be of value. I think, perhaps, a scale showing the changing costs in

drilling, because it has become cheaper, and that sort of thing might be of some value but aside from that at the moment I cannot think of any contribution which I can usefully make to you.

MR. CHAIRMAN: And you do not know how long the compilation of such a statement as you suggest would take.

MR. SMITH: No, but I think they have done considerable work on it, and they can get it with a fair degree of accuracy in comparatively short time. I think my people only came into this yesterday or the day before yesterday. I think they have already anticipated and tried to do something along that line. It may be that you would want to hear from some different companies, that is the drilling companies this history of costs from when Turner Valley was opened, I mean opened as a gas field, because if you are going to find a price it seems to me costs must enter into it to some extent, and I thought the whole history of the cost would be something of importance if I could get that before you. In other words, I know there is a tremendously lot more money gone into the ground than has as Yet come out of it.

THE CHAIRMAN: Mr. Smith, we will be very glad, indeed, to hear anything that has any bearing whatsoever on the matters which we are called upon to enquire into, and I do not want you to think that we are disinterested in who may come before us or how the matter will be presented from anything which have had to say to you this morning.

MR. SMITH: Oh, no, sir.

THE CHAIRMAN: We do not, as Commissioners, desire to

direct anyone in the formulation of their case because we do not want to seem to be taking sides, to be directing the evidence and then hearing it and weighing the value of it.

MR. SMITH: Quite right, my lord.

THE CHAIRMAN: We prefer, so far as it is possible, we will participate in the framing of a programme of procedure, I mean by that how in our view the Commission Counsel, we will go into consultation with them, to see how they can most expeditiously bring before us such evidence as they propose to introduce, which has a bearing upon these several points that we are enquiring into, but it is not our present view that we should direct the Commission Counsel as to what witnesses he should call, what investigations he should make, or whom he should have here, less it smack of our preparing the case and then hearing it.

MR. SMITH: I quite appreciate that, My Lord.

THE CHAIRMAN: Now, short of that, we are interested in anything that has any bearing on the questions before this Commission, and bearing in mind the opening paragraph of the Commission it would indicate that the whole idea of the Enquiry was at the last sittings of the Legislature in the Province of Alberta, and it would seem likely that at the next sittings of the Legislature of the Province of Alberta, they might want to have a report and perhaps act upon that report. From what the Commission has heard to-day, our problem is to get started rather than to finish, and we are both exercised in that. Here we are solemnly appointed and with nothing to do.

That is not a criticism of the Commission Counsel, of course. He cannot act as such until the Commission is constituted, but there is this circumstance, and I am wondering if any counsel here present concerned with any of these problems can suggest how we can get to work on something more quickly than a month. Surely there must be some phase of this upon which those who have knowledge could introduce evidence in order to give that knowledge to us before a month's time. I suggest this to you. It is not adjournment time, but I suggest that for the rest of the day to the extent that you can give the rest of the day to it, that all counsel go into conference here to see what can be accomplished in the way of working out, if we cannot start with something, Mr. Frawley, before a month's time. If we cannot why we cannot. We think a meeting of counsel might really advance our work somewhat and we will sit again at 10:30 to-morrow morning to see if we can make any advancement as a result of your conference, if you care to hold it.

MR. HARVIE: With great respect, if I might be allowed to interrupt, if possible that time might be made 2:00 or 2:30 to-morrow afternoon, it would mean that both Mr. Nolan and myself take instructions from the East, the offices are now closed there and if we could work at it this afternoon and have an opportunity of discussing it by 'phone or otherwise, with them to-morrow, to see if they might approve of any suggestion we might have to make.

MR FRAWLEY: I am equally concerned, sir, with the fact that the Commission is now constituted, and the work does seem to be so far in the future, but I was impressed with the need and the advisability of having some meat to chew before we met again. Now, I can meet to-morrow, I know there are a lot of poeple in Calgary, oil-minded persons, who can come and give us very interesting discussions about a good many phases of this, but I just thought, that perhaps, it would not be as effective as if we just had some really solid stuff to offer the Commission. There are a few things that Mr. McFarlane can tell us about the Ethyl Corporation but I do not think that would serve very much, because I think if that were put in its place in the marketing picture, it would be much better, but I want to get going before a month, if I can.

THE CHAIRMAN: We are not going to dictate as to how you present the case you wish to present, but if there is some phase of it that you could just as well present in two weeks and have it over with, as in six weeks, then let us have it.

MR. FRAWLEY: By all means.

THE CHAIRMAN: And I suggest, if all counsel got together, we hope to avail ourselves of the opportunity, as we have told you, of speaking to you as commission counsel, as to a general programme some time this week, but in the meantime we thought, perhaps, it would advance the whole scheme of proceeding if counsel woul talk it over, and they would accomplish more, I think, in the barristers' room than they might right here.

MR. NOLAN: I was not quite sure if Mr. Frawley accepted the suggestion of the Commission, conveyed to us through the Chairman, that perhaps we should prepare a statement which could be checked by Mr. Cottle. It seems to me that would save a lot of time and trouble on the part of Mr. Cottle and we would get to the same point in the end because he can build up his conclusions on the statement as prepared by us and as checked by him.

MR. FRAWLEY: I say at once it is an excellent idea. I have spoken to Mr. Cottle and Mr. Cottle says it is just a matter of with how much particularity they send us those statements.

THE CHAIRMAN: It might save a great deal of Mr. Cottle's time.

MR. FRAWLEY: That is it.

THE CHAIRMAN: Well, Gentlemen, you may discuss that as well as all other things and unless there is some objection to our so doing, then we will adopt Mr. Harvie's suggestion and sit at two o'clock to-morrow afternoon and then try and arrive at some appropriate adjournment date, after you have talked it all over together, and yourselves worked out when you think we should meet, when you think we can meet with advantage. The Commission, I may say, is anxious to proceed with this, having got it under way, at least having been appointed to get it under way, we would like to get it under way, but we can quite see there is no advantage in getting started until we have something to talk about. At the same time there must be some measure of definiteness about it. We all have other things to do and have to make

arrangements accordingly. However, we will leave it all over until two o'clock to-morrow afternoon.

(The Investigation was here adjourned and resumed at 2:00 p.m. October 18th.)

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October 18th, 1938.
2 P.M.

George H. Taylor, was duly sworn in as Court Reporter to the Commission.

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COUNSEL PRESENT:

J. J. Frawley, Esq., K.C.,

A.L. Smith, Esq., K.C.,

H. G. Nolan, Esq., K.C.,

E. L. Harvie, Esq.,

.....

MR FRAWLEY: We met yesterday afternoon and spent some considerable time discussing chiefly Mr. Lipsett's suggestion to you, Sir, that something might be accomplished by requesting of these Companies some particularity of their costs, and we think that suggestion is a very good one, and that a great deal will come out of it. It may not be possible to satisfactorily prepare it in the form of a questionnaire. It might be necessary for Mr. Cottle, to go to the Head Office of the Company in Toronto, and spend just a very short time with them, giving them an idea at close range of the kind of information which they might get out for him, and for the Commission. When that has been done, then I think we can expect the Companies - and it will be more than they have been asked to do before, but not more than they will be willing to do I think, - along

the lines of Mr. Cottle's demands to get out certain kinds of information out of this great mass of cost information which they have. Then after that has been obtained, as your Lordship will see, it is then necessary for Mr. Cottle to analyse it and put it into the form of a submission to the Board.

THE CHAIRMAN: And I daresay make checks upon it as he thinks wise.

MR. FRAWLEY: First of course to check and then, this is just assuming and anticipating things - he might want to take something out of that for submission to this Commission that it be not allowed. To do that he must very carefully prepare the ground and not make that in any hasty way, because Mr. Nolan and his clients will desire to cross-examine him very closely on that, and in turn make counter-submissions. I point these things out to indicate to the Commission that a great deal of work is involved and as you were kind enough to say yesterday there is no blame attached to anyone at the moment. The Commission has only just been set up, and it is detailed, very detailed work that, because it is of great importance, must first be done. It is quite true there could be a little bit of evidence submitted say in two week's time or three weeks' time, perhaps that would be in the first place out of order. I doubt if it would accomplish a very great deal. For instance I was just thinking we might have the Ethyl representative in, and we could spend a couple of days with him asking him about the licensing system and discussing that with him. Then we would be through

We would perhaps have to wait for some further period to get some further information. We might also bring the Imperial people who have posted the price of crude oil in the Valley and ask them to make an analysis of that crude oil price. Even so I would much prefer to have that submitted to Mr. Cottle first, and that that should be included in Mr. Cottle's demands upon the Company, so that he will have an opportunity of analysing the factors which went into the determination of that crude oil price, so that if there is anything put in it at all that wants questioning, that can be done when they come to submit it. What I am saying all brings me to this that I can see no advantage in a very early Sittings of the Commission. After all, as your Lordship pointed out yesterday, the main thing is the completion of the Inquiry and the making of the report. That is all-important. As your Lordship said yesterday it should be done during the next Sittings of the Legislature. I would be just speculating that perhaps around the 1st of March one might hope to have that report for the Legislature, assuming.....

THE CHAIRMAN: It would depend entirely upon whether all the evidence is in.

MR. FRAWLEY: Assuming that is a sort of a deadline, you might say, then it is very imperative.....

THE CHAIRMAN: If the report is to be of any value it must be a considered report. There must be ample time allowed to the members of the Commission to weigh and value the evidence they have heard.

MR. FRAWLEY: Yes. I would say suppose we set roughly a month for that, that brings us back to

the 1st of February, and that means January and December going pretty steadily in making out this case.

THE CHAIRMAN: Do you think you can do that in that time?

MR. FRAWLEY: Yes, it is my hope if we have most of our information we can make out submissions pro and con to the Commission in two months' time. Mr. Nolan, who will have a great deal to do with it, is perhaps unable to venture any helpful suggestion about that. But I would think so. It would be my expectation that could be done. I do not mean at all, because this is only the middle of October, I do not mean at all that no part of November would be used. I am hopeful we will get going then. So I come back to what I said yesterday about an adjournment say for thirty days.

THE CHAIRMAN: In view of what you now say would that be enough for you?

MR. FRAWLEY: Well I am glad to have your Lordship make that remark. It might be better to say, instead of four weeks, to say six weeks, with all the more reason then to suppose that we could get going.

THE CHAIRMAN: Gentlemen, have you anything to say?

MR. NOLAN: No, except, Sir, that I do appreciate the difficulty and in our conversation yesterday Mr. Cottle pointed out to us certain things that we were not aware of. For example the books of these various companies are not kept for the purpose of adducing evidence for Royal Commissions. They are kept for the purpose of transacting their own

business. So that they all have to be reviewed, re-vamped, and readjusted, and figures taken out of the books for the purpose of presenting them to the Commission in intelligible form, and so that they will be of some assistance to the Commission. I know from what Mr. Cottle said he had grave doubts as to whether or not he was going to be in a position to make a report of any kind at the end of the thirty day adjournment, and expressed the view that if more time could be given now, more time would be saved later on.

MR. SMITH I have nothing to say.

THE CHAIRMAN: Well, Mr. Frawley, what date do you suggest? We should start on a Monday, I expect, whatever the Monday might be. What about the 5th December?

MR. FRAWLEY: I would say yes, Sir.

THE CHAIRMAN: That is certainly giving you ample time to make a start?

MR. FRAWLEY: Yes Sir.

THE CHAIRMAN: Satisfactory to you gentlemen?

MR. SMITH: Yes, my Lord.

MR. L. L. PLOTKINS: I would like permission to make a submission and to see Mr. Frawley for a second or so, and acquaint him with what I am going to do.

THE CHAIRMAN: Yes, very well.

MR. FRAWLEY: The gentleman is Mr. L. L. Plotkins who operated a refining and marketing business in the Province under the name of Lion Oils.

THE CHAIRMAN: He operates.....

MR. FRAWLEY: He operates a refinery and a

marketing system in conjunction therewith, now to be quite accurate, your refinery operates under the name of the Lion Refining Company?

MR. PLOTKINS: Yes.

MR. FRAWLEY: And the marketing end of your business is carried on under the name of Lion Oils Limited? So Mr. Plotkins desires to make a statement now to the Commission. I see no reason why he should not make it.

MR. SMITH: My thought is, if we are going to adjourn these things, why have this now? Why piece-meal something Mr. Plotkins has got to say, and afterwards.....

THE CHAIRMAN: Is your submission in the form of a short draft, Mr. Plotkins?

MR. PLOTKINS: A written statement dealing with the principles under which this Commission, at least my submission that certain principles have to be considered before the Commission proceeds. I would like to point them out for your consideration, and I have made this draft, a written statement of three pages. I do not intend to make very many comments, in fact probably no comments.

THE CHAIRMAN: What is the objection?

MR. SMITH: It was not an objection. It was just a thought. I thought we had decided to proceed in an orderly fashion, and if you accept this now, it is proceeding in a completely disorderly fashion. If we are abandoning that principle, well and good. It seems to me that is exactly what we are doing. If we are going to investigate some

refineries I take it this is one of the refineries to be investigated.

MR. FRAWLEY: Let me make this suggestion. Let me read the memorandum through, my Lord. I do desire to keep the presenting of this evidence in orderly fashion, and if this would seem to throw it into any form of disorder, these three pages of Mr. Plotkins.....

THE CHAIRMAN: I do not think the reception of these three pages is going to throw us into any state of disorder up here.

MR. SMITH: My doubts were about the three pages. I have been through this before. It will be forty before you are through.

MR. FRAWLEY: This is to be evidence. I take it that nothing goes in before the Commission except evidence?

MR. PLOTKINS: The only purpose is to have this on the record. That is why I want to read it.

MR. FRAWLEY: Take the witness stand, Mr. Plotkins.

LEON L. PLOTKINS, having been duly sworn, testified as follows:-

I have written this so I might take only a short time to present it.

" I assume that the purpose of the Government "in instituting this inquiry is to determine the "cost of producing petroleum products and "distributing them in the Province of Alberta "and whether the cost to the consuming public "of these products is too low or too high, having

"proper regard to all the controllable and
"uncontrollable factors that make up these
"costs.

" I further assume that another purpose is
to encourage employment by the development of
"Alberta's oil production, Alberta refineries
"and products marketed by Alberta concerns (on
"a basis of fair prices to the consuming public
"fair wages to the employees of the different
"concerns engaged in the industry and reasonable
"returns on the actual capital invested).

" I also assume that another purpose is to
"inquire into the conditions existing in the
"industry and determine --

"1. If the prices fixed by the Imperial Oil Limited
"for the different products are reasonable, too
"low or excessive.

"2. What services apart from the products sold
"are included in the sale price, including credit
"terms; discounts; loan of equipment, drums,
"containers, dispensing pumps and tanks; credit
"cards; subsidies in the form of rent advances on
"mortgages; etc.

"3. What effect, if any, these various services
"have on costs.

"4. If the conditions existing in the different
"phases of the oil industry in Alberta as a result
"of present policies of Imperial Oil Limited permit
"of free competition or do they restrict the

"operations of independent native companies and
"create what amounts in practice to a monopoly.

"5. Are the prices fixed by Imperial Oil Limited
"on the basis of the industry taking advantage
"of modern, improved, and efficient means of
"producing, refining, transporting and marketing.

" Now it is to be assumed that the government
"in this inquiry is endeavouring to protect the
"public interest and at the same time encourage
"and protect private industry in the province
" of Alberta.

" It is almost generally conceded that any
"citizen has the right, if he so chooses, to
"engage in the oil business in any or all its
"phases as a means of earning a living, and that
"it is a legitimate legal enterprise; It follows
"then that the government in all fairness should
"consider and respect the property and rights
"of individuals engaged in the industry.

"It is my intention at the proper time to
"present evidence for your consideration and
"to deal with particular problems affecting
"the individual engaged in the production,
"refining, transport and marketing of petroleum
"products.
"I want to dwell on the question of distributing
"facilities and the right of the individual to
"engage in this activity without having to face
"government restrictions. We have heard it
"repeatedly mentioned that there exists too

"many outlets both wholesale and retail.
"You will have to judge as to that, but I will
"say that the question is not capable of being
"answered in the abstract. As long as we accept
"the principle of private enterprise developing
"crude oil production and refining, then it
"follows that the right to market the products
"of their industry is equal to the right of
"all others in the business to do so, and should
"be conceded in this inquiry."

That is the main point I wish to bring because after all you start an Inquiry and there has no one said what the actual purpose was and as far as I know there have been no principles dealt with along which the Inquiry is to proceed, and if we accept private ownership as the starting point, then naturally the aspect of the criticism that will be levelled or that may be levelled will have to be considered in that light,

" Considerable legislation has been passed
"and enforced with a view of restricting these
"rights, and it is my intention to give
"evidence to show that such a policy on the
"part of the government is detrimental to the
interests of the people of the Province and
"to the citizens engaged in the Alberta oil
"industry, as we must remember that the distri-
"buting end of the industry is, with changing
"conditions, in a constant flux, and is at
"present undergoing a Considerable change that

"is resulting in more efficient marketing and
"lower costs to the consumers.
" In this inquiry the commission should weigh
"the evidence presented as it applies to
"individually owned businesses in the light of
"practical realities facing private enterprise,
"acting under the compulsion of constant change
"and competition from major companies and the
"effects of present government regulations and
"policies, and base its conclusions accordingly.

Respectfully submitted

"Leon L. Plotkins

Leon L. Plotkins

for Lion Oils Limited.

Lion Refining Company

Lion Oil Producing Company.

Lion Transport.

That is all I have to say at present.

THE CHAIRMAN: I think, Mr. Frawley, it would be convenient to mark this as Exhibit, do you not think so? Merely from the standpoint of more easily being able to get at it than to reading it out of the record every time. I thank you, Mr. Plotkins. In that connection, Mr. Frawley and Gentlemen at the Bar, I was just wondering, there will be many compilations to be put before the Commission, no doubt, before we are through. I think perhaps the same applies to all of them. If you get them in such order that they can be made exhibits one after the other, it will be

more convenient to us who have later to consider them instead of reading a mass of figures into the records of the evidence.

MR. FRAMLEY: It is, of course, infinitely moreconvenient to read it from a statement than from the records. Take what I was doing yesterday goes down into the records in paragraphs.

MR. NOLAN: It is untelligible.

THE CHAIRMAN: Perhaps in the work you are doing in the next two weeks, you and all Counsel concerned would have that in mind and it would be a great convenience, and an advantage to the members of the Commission who have to deal with it. I take it, Gentlemen, you are all satisfied we should next meet on the 5th day of December, probably in the Court of Appeal room at Calgary, in this building?

(The commission then adjourned)

.....

The Province of Alberta

IN THE MATTER OF THE PUBLIC INQUIRIES ACT

—and—

IN THE MATTER OF a Commission, dated the 12th day of October, A.D. 1938, to inquire into matters connected with Petroleum and Petroleum Products

Commissioners:

The Honourable MR. JUSTICE McGILLIVRAY (*Chairman*)

—and—

L. R. LIPSETT, ESQ.

Session:

CALGARY, Alberta 12th December, 1938

VOLUME 2

I N D E X

I N D E X Cont'd.

.....

December 5th , 1938.

The Commission met and on application by Mr. Frawley and Mr. Nolan was again adjourned until the 12th day of December.

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December 12th, 1938.

PRESENT: J. J. Frawley, Esq., K.C., - Representing the Alberta Government.

H. G. Nolan, Esq., K.C., - Representing the Imperial Oil, and subsidiary Companies.

E. L. Harvie, Esq., K.C., - Representing the British American Oil Company.

A. L. Smith, Esq., K.C., - Representing the Independent Producers.

J. E. A. Macleod, Esq., K.C., -Representing Taxaco Oil Company.

D. G. MacKenzie, Esq., K.C., - Representing the Ethyl Corporation.

.....

MR. FRAWLEY: There may be some new appearances this morning, Mr. Chairman. I am not quite sure. Mr. Campbell is here I know. This morning, Mr. Chairman, we will proceed with that part of the Inquiry which is given to an examination of the gathering, handling and transporting by pipelines of crude oil. I propose first to deal with the question of the life of the Turner Valley Field, that being a necessary factor in the computations of the accountant, Mr. Morrison, who will follow. Dr. Boatright of Houston, Texes, will give you expert evidence with respect to the life of the field, that is estimating the potential reserves and in that way arrive at an estimate on the life of that field. Then it is proposed that Mr. Nolan

should follow on, still on the question purely of the life of the field and that that matter should be disposed of by us before we then proceed with the accountant's evidence which, of course, follows on very naturally after the estimate has been made of the life of the field. Then, lastly there may be some evidence for the Commission with respect to some of the other matters in the program; that is whether there is any undue discrimination or anything of that sort in the operation of the pipeline. If that meets with the approval of the Commission, that is the manner in which I propose to proceed. So I will call Dr. B. B. Boatright.

.....

DR. BYRON B. BOATRIGHT, having been duly sworn, examined by Mr. Frawley, testified as follows:-

Q Do you live in Houston, Texas?

A That is correct.

Q And by profession you are what?

A A petroleum and natural gas engineer.

Q Where were you born?

A In Colorado Springs, Colorada.

Q When?

A Frbruary 10th, 1900.

Q Where did you graduate first?

A Colorado School of Mines in 1922 with an Engineer of Mines degree.

Q And then following your graduation what did you do?

A I was employed by the Mid-West Refining Company in the Big Muddy Field in Parkerton, Wyoming for approximately one year.

Q And then?

A I was employed as tool dresser in the Salt Creek Field for the Mid-West Oil & Refining Company for a period of

approximately two additional years. Following that I was employed by the Bureau of Mines, Oil and Gas Leasing Division, which had charge of oil and gas leasing operations on Government land for approximately another two years.

Q That is the United States Burearu of Mines?

A That is correct.

Q At the time of leaving I was in charge of the State of Colorado for that division.

Q Yes.

A From about 1926 until the end of 1928 I was employed as District Petroleum Engineer by the Marland Oil Company of Texas, my operations including North and West Texas. From 1928 until September 1937 I was employed as head of the Department of Petroleum Engineering and Professor of Petroleum Production in the Colorado School of Mines at Golden, Colorado. During that period of time I also maintained an independent consulting office at Golden, and since that time I have been a member of the firm of Parker, Foren, Knode & Boatright, with offices in various Texas cities as consulting engineers, petroleum and natural gas engineers.

Q Now, did you take a degree at any time since your graduation in 1922?

A Yes, Philosopher's degree from the University of Colorado obtained in 1936.

Q And what kind of subject?

A Petroleum geology.

Q As consultant since 1928 or 1929, what kind of work have you been doing, what kind of consulting engineering have you been doing and connected with?

A It has included practically all phases of production and engineering work, starting in with drilling, production, gas and gasoline plants, pipelines both oil and gas; valuations for various companies in various areas throughout the Mid-Continent and Gulf Coast region.

Q Have you had any experience in estimating field reserves'

A Yes, considerable. A great deal of our work involves that particular phase of the business.

Q Now. Dr. Boatright, I have brought you from Houston, Texas, to give an opinion to this Commission with respect to the probable life of the Turner Valley Field. That is correct?

A That is correct.

Q You have arrived at an estimate?

A I have.

Q And in the work that you have done leading up to that opinion, have you had access to all the information which you have felt it necessary to have access to?

A Yes, I have.

Q And where has that information been available?

A From the Canadian Geological Survey and Conservation Offices here in Calgary.

Q Do you find that adequate data and adequate records were kept at these Government Offices to enable you or anyone like you, to arrive at the kind of estimate you have arrived at?

A Yes, I do.

Q You say you have arrived at an estimate?

A That is correct.

Q Now, Doctor Boatright, you know so much more than I do

about this that I do not know that I can be of any particular assistance in questioning you and asking you for answers as we go along. I would like you in your own way to proceed and give the Commission such diagrams on the Turner Valley Geology and the resources of Turner Valley as you have, and then proceed and tell them the manner in which you arrived at your estimate: finally, give the Commission the estimate at which you have arrived?

A In presenting my idea of the resources in Turner Valley it may be as well to start out with just some general information concerning the field itself. It is located thirty-five miles South West of Calgary, and includes Townships 17, 18, 19 and 20, of Ranges 2 and 3, West of the Fifth Principal Meridian. The peg model represents the Turner Valley field, and the upright posts, of course, represent the various wells that have been drilled in the field, with the different coloured bands ~~on the~~ poles to signify the different geological horizons. ~~The strings which you will~~ notice tied and connecting the various wells, represent the top of the lime and the red string which runs from North to South across the field approximately, represents the present oil gas contact line. The peg model has two cellophane divisions upright across about the middle of each end, and on those cellophane divisions are marked the approximate way in which the various formations lie, together with their names. Starting in at the top we have the Belly River formation, followed by the Benton, Blairmore, Kootenay, Fernie, and the Madison Lime.; the Madison Lime being

of course, the productive horizon. The area included in the field is about seventeen miles in a North-North-West direction, and at present the productive horizons vary from a width of about a mile and three-quarters to a mile and a quarter. The field was discovered in 1913, the first well being the Dingman Number 1 which was completed as a cable tool well in one of the upper horizons on May 14th, 1914. That well incidentally, led to the first boom in the Field, which, of course, did not result in any great amount of development. The discovery well in the limestone was the Royalite Number 4 well which was completed on October 20th, 1924. This well, produced for about ten years, and was abandoned finally in 1934. It was a cable tool well and encountered the top of the lime at about plus 575 feet above sea level. I may explain what I mean by that. It is common to take some common level as a reference point for measuring the top of the lime. Sea level is quite often used, and when I say the top of the lime is 575 feet, that simply means that the top of the lime is encountered at an elevation of 575 feet above sea level. I might say that the structural geology of the Turner Valley Field has been studied by a great number of people over a long period of time. The first work was done in 1913. Since that time there have been numerous geologists work on the Field, and the ideas that I am giving here, of course, are merely the results of my study of those men's thoughts on the subject, and in general the field amounts to this:- The structure consists of an anti-cline, as is shown by this cross-section, sharper on the East side and with a gradual slope of about twenty to twenty-two degrees on

the West. That Field is underlain by a fault or break in the sediments on the East side. This seems to pretty well underlay the Field, at least in its North and South ends. In other words, it is a sort of saucer shaped fault, blocking in the Field at both the North and South ends, and running along the outside line of production here on the peg model. Then at the North and South ends of the field - perhaps I had better stop - at the South end of the Field the structure dips off gently and it is possible that this fault entier ends up in another fault or it might extend on beyond. At least the South end the fault dips off rather gently. At the North end the fault may or may not do that. It is my own opinion that possibly it also bends off rather gently giving a closed structural trap for the accumulation of oil and gas. This North and of the Field, incidentally, is more broken by faults of small magnitude than in the South end, and it is possible that the interpretation of the North end is not any too accurate, because of the fact that there has not been sufficient development to justify any definite decisions as yet. I might say with reference to this fault that there has been numerous wells drilled through the field which encounter the fault and enables a pretty good picture to be obtained of that particular fault. Now in determining this structural condition, there have been a number of criteria one of which is the regional characteristics and the formations running along the Foothill area. Of course, there have been any number of men studying this, and the concepts are pretty well determined as to the points in the whole area lying on the East side of the Canadian

Rockies. That is supplemented, of course, by studies of the surface geology, and by an interpretation of the well logs. I understand that there has been some geophysical work carried on in the Field, but that did not give any very definite results. The stratography of the Field I have already given, the order in which the various formations occur. As far as this thing that we are considering is concerned, we can disregard the upper horizon. In other words, there has been some production there, but it is not important. Our estimates here involve only the production from the limestone sediment themselves. I may say there were only four sands in the upper sections which were productive in a few wells, or in one or two wells. I do not believe it is necessary to discuss those sands. Coming to the lime we find that we have a section there ranging about fifteen hundred feet in thickness, and with the tops varying from a depth from 525 feet above sea level to a minimum depth of minus 5707 feet below sea level, the average top of the lime being hit at about minus 3000 feet. The surface elevation ranging on an average of about 4100 feet which makes the average top of the lime around 7100 feet. The limestone has three productive horizons, the first being encountered right in the top point of the section. It is not present in all wells. Occasionally they find some porosity with a little gas in the top ten feet of the section. Then down in the lime we find a second horizon of that so-called upper pay which averages about ninety-five feet in thickness. The section varies in different parts, but the average over the Field gives a thickness of porous section there of about ninety-five feet. The second or lower section is

just at the top of the black lime which is found at about four hundred and fifty feet in the lime, and which averages about seventy-five feet in thickness, and the porosity of the whole section amounts to about five per cent. In other words, taking all of the wells in the Field of which the Geo-Survey has records and analyzing the cores in small sections, and weighing the average, we find that there is about one hundred and seventy feet of porous section. The porosities range from about zero to a maximum of about twenty per cent, and average about five per cent. That means in slightly different language, that there is about eight feet of porous section in the lime throughout this whole productive area. In other words, there is about eight feet of void there in each well. That is what that porosity figure gives. The oil and gas in thie Field is thought by the majority of investigators to have originated in the lime itself. That is not particularly important in our problem. As far as reservoir energy is concerned, it is my feeling that the Field is not under water drive. There is not a great deal of data upon which to base that decision, except the fact that there have been rather enormous withdrawals from the reservoir without any noticeable amount of water being produced. We know water is present in the horizon, because of the Okalta Number Six well which was drilled into the water on the extreme West edge, and still there has been no indication of water migration. It does not, of course, follow, but it is an indication that the Field is not under water drive. That means the primary source of energy for production in the Turner Valley Field will be the natural gas which is there, augmented to a certain slight extent by force of gravity during the latter stages of the Field's life. Both cable

tools and rotary tools have been used in the Field, but at the present time rotary tools are used mostly. Wells take from six to eight monghts to complete, and cost from one hundred and twenty-five thousand to one hundred and seventy-five thousand dollars per well. The deepest one in the Field is Okalta Number Six , which encountered the top of the lime at 9731 feet, and has a total depth of 10,290 feet. The average depth, as I have already given, is approximately 7701 feet. The well spacing is approximately one well to forty acres. There are some areas that have wells spaced slightly closer than that, but generally they are spaced one well to about forty acres. It might be well to mention in connection with the drilling that crooked holes have played quite an important part in the Field's life. Most of the early wells were very crooked, and, of course, led to a great deal of confusion in trying to work out the geology of the area.

(To to Page 119).

The recently drilled wells are I believe fairly straight and the drilling contracts require that a certain amount of straightness be observed but the old wells were very crooked and account for a lot of the geological discrepancies which we observe.

I have here a summary of the well-completions by years in the lime. It might be well to read that and I can furnish you with a copy of this if you care for it. In the year 1924 there was one well completed and 1925 no wells were completed. These are limestone wells primarily. In 1926 one well was completed. 1927 three wells; 1928 ten wells; 1929 sixteen wells; 1930 thirty-nine wells; 1931 eighteen wells; 1932 three wells; 1933 three wells; 1934 seven wells; 1935 four wells; 1936 six wells; 1937 three wells and of course we are in 1938 now. There are approximately 16 wells possibly drilling at the present time with from four to ten locations that may possibly be drilled, which are not drilling at the present time, that makes the total wells drilled into the lime amounting to 114, which now there are 101 potential producers, that is in other words 13 wells have been abandoned on account of crooked holes or some other condition of one kind or another. I may say that there have been about 285 to 289 wells altogether drilled in the field.

Coming to production, all the wells in the field at the present time flow naturally into separators and there in the separator the gas is taken away from the oil. The oil drops out and the gas goes to the gasoline plant, through the pipeline or is popped into

the air. The pressure varies between zero and 330 pounds per square inch. The field is not particularly a water problem at the present time and acidizing has proven fairly successful in increasing the production from the wells or re-working the wells after their production has dropped down.

The crude oil that is produced in the field the gravity varies from 39 to 70 degrees and the average around 43 degrees at the present time. The price starts in at $1.14 a barrel and increases two cents per degree of gravity up, making a gravity of 60 degrees worth $1.52. The gasoline price is based on vapour pressure and 17 pounds pressure amounts to $2.18 a barrel with the 20 pound vapour pressure gasoline $1.94 and 24 pound $1.82 per barrel.

Q When you say "gasoline" you are referring to "absorption plant gasoline", what we call "absorption gasoline".

A That is right, yes.

The naphtha which is produced from the gas area drops out in the separator and is priced as follows:

The price starts out at $1.54 for gravities ranging between 60 and 60.9 degrees, A.P.I. Then that increases two cents a barrel until the gravity reaches 65 when it is $1.62 a barrel. For gravities over 65 the price is $2.14 a barrel.

The gas produced from the field has approximately the following composition, contains about 88% methane, about 6½% ethane, 3½% propane, about 1½% butane, and slightly over one percent pentane and heavier. Now

I might explain a little about that gas. The methane and ethane are purely gaseous and have no possibility of being condensed as a liquid. All the rest in the above proportions can be obtained out of the gasoline either in the absorption plant or portions of them in the separator. The naphtha the so-called naphtha, simply means that a larger proportion of the pentane and heavier are present than in the absorption plant gasoline. In other words the absorption plant is taking out practically all the methane and ethane, whereas in the separator naphtha a slight part of the propane and butane is taken out. In other words the difference is in the quantities of these various constituents, the methane, the ethane, propane, butane, pentane and heavier.

The price paid for natural gas varies for different needs, but ranges $10.00 a boiler day for boilers and the scrubbed gas at the end of the gasoline plant is seven and three quarter cents per thousand cubic feet, and I might explain that in talking about gas it is necessary to specify the temperature and pressure at which that gas is measured because gas is very compressible. The pressure which is used in all the calculations which I have made is 14.4 that is the pressure base, in other words that gas was measured in a container under a pressure of 14.4 pounds per square inch. The temperature at which the measurements were made is 40 degrees fahrenheit. The going field price varies from two to four cents a thousand cubic feet, which is approximately the prices which are re-

ceived in the States for the similar products.

The field shows some evidence of gas and oil migration, that is there are certain wells in the field which have shown some evidence of oil migration in the gas cap, and also there are some areas in the field where the oil wells have shown some evidence of the gas migrating into the oil area. There are not very many of these wells and there evidently has not been such a great amount of it going on but there is some. In other words there are low pressure areas built up. The other fluids are going to come and try and fill up any of these and as a result it will change the gas-oil ratio in the various areas either up or down.

There are four gasoline plants operating in the field at the present time, having a total capacity of about 175,000,000 cubic feet per day.

Q Dr. Boatright, What does gas-oil ratio mean?

A Yes, I should have explained that. Gas-oil ratio refers to the proportion of gas to oil which is produced by a well and is ordinarily expressed in thousands of cubic feet per barrel of oil. In the (cont'd on page 123.)

Turner Valley Field, in the gas cap, the gas-oil ratios range from twenty thousand feet per barrel up to several hundred thousand feet per barrel. In the oil horizon as defined by your conservation committee, the gas-oil ratios range from a maximum of about thirty thousand feet per barrel down to a minimum of about six hundred and ninety feet per barrel or somewhere thereabout, and that simply means, a thousand cubic feet per barrel would mean that with each barrel of oil a thousand cubic feet of gas is produced. Does that answer what you have in mind?

Q Yes.

A I have here a table showing the production of oil, gas, gasoline and naphtha from the Turner Valley Field from the beginning. What would be your pleasure as to that.

Q Is that a large statement?

A It is a large statement.

Q I see it has not been typed.

A No.

Q If it were typed then we could file it as an exhibit with the commission?

A All right. I will just draw from this a few figures and then do as you suggest.

MR. FRAWLEY: Might we give it a number now for reference purposes as the witness produces it so that it will not be lost.

THE CHAIRMAN: It will be Exhibit "2".

(Table showing production of oil, gas, gasoline and naphtha from Turner Valley Field here marked as Exhibit "2".)

WITNESS: All right. I will simply read the summary

figures which include all production up to January 1st, 1938. There are seventy-two gas producing wells and sixty-two oil producing wells at the present time. At the end of 1937 there were eighty-one gas producing wells and twenty-nine producing oil wells. The total crude production amounted to 2,702,976 barrels. As I mentioned previously those figures are taken from the best available records in the geological surveys office. I might explain there that the division between crude oil and naphtha has had to be more or less arbitrary. Crude oil in the field as defined includes anything between a gravity, or includes everything up to a gravity of 60 degrees. Everything above that is either naphtha or gasoline and because of the fact that some wells produce a mixture of actually what is naphtha and actually what is crude oil, others produce purely naphtha and others produce crude oil, there might be some discrepancy in the figures for crude and naphtha. The total for crude and naphtha being as nearly correct as it is possible to get.

The barrels of naphtha which had been produced to the end of 1937 amounted to 7,821,547 barrels. Total of both crude and naphtha from these two figures amounts to 10,524,523 barrels, The field has produced to the end of 1937, 959,870,000,000 cubic feet of gas. Let me see now, no, that is cubic feet, yes, that is right, 959,870,000,000 cubic feet of gas, or just slightly under one trillion cubic feet. The average gas-oil ratio which of course is merely of academic interest amounts to 91,000 feet per barrel. In other words for the field over the whole of

its life, its whole life, the gas-oil ratio has been 91,000 feet per barrel.

There have been produced 2,408,962 barrels of gasoline.

The shallow sand production, that is production from sands above the limestone, amounted to 440,794 barrels. In connection with these figures it is interesting to note that approximately 13,000,000 barrels of crude, naphtha and gasoline have been produced out of the field altogether. I mention that figure because later on in arriving at the reserve I shall use that figure of 13,000,000. If we have these figures here for gasoline and naphtha they will not come out exactly the 13,000,000 but it is close enough for all practical purposes.

Q Thirteen million barrels?

A As being the production to the end of 1937, that is crude, naphtha and gasoline. The approximate division of the production amounts to this, the crude from the limestone amounts to about 89% of the production, the naphtha represents about 10% and the shallow crude 1% of the total production from the field. That is merely a summary figure.

At the present time the field potentials amount to about 7 hundred million cubic feet of gas per day. That is if the field were opened wide-open and based upon the tests made in the field, the field is capable of producing about 7 hundred million cubic feet of gas per day and sixty-two thousand two hundred and sixty four barrels of oil on a two inch choke.

With reference to that potential figure it is interesting to make the following observation and that is that any

potential figure is based upon the recoverable on a certain period of time in the well's life, it may be based on twenty-four hours or forty-eight hours or half a day, but the potential figure is not a true figure of what that field will actually produce. In other words if we would start and open all the wells simultaneously in the field we could produce over a short period of time at that rate but due to the pressure drop in the field we would not be able to keep them flowing for any appreciable length of time, the drop in the gas, we would not be able to reach a rate of over fifty percent, even under maximum conditions, and the same thing is probably true of the oil. As you all know the field is under proration and while the proration program is going to have some effect, considerable effect as a matter of fact, upon the actual reserve, in my figures I have assumed that proper practices will be followed in future in the Turner Valley Field, in getting these recoveries which I have set out. The field is pro-rated, as probably most of you know, on the basis of rock pressure, potential, acreage. and gas-oil ratio, twenty-five percent being allotted to each one, and a minimum displacement of three thousand feet per barrel being allowed. Any well having a high gas-oil ratio, its allowable is cut down to the equivalent of the displacement of the producing well, twenty-two thousand feet per barrel of gas and that is the prorated figure to the other wells.

There is a refining capacity in this area of about nineteen-thousand barrels per day and the average consumption for this general territory amounts to about eighteen-thousand barrels per day, the average for the year, with about three-thousand barrels coming in from outside sources,

giving Turner Valley a potential market of about fifteen-thousand barrels a day. I might say in that connection that I used that figure in arriving at the life of the field.

Now in making the reserve calculation in areas of this type there are three possible ways that one might go at it. (1) The first is on the basis of porosity and by that I mean this, if we take the actual amount of productive section in the lime and the amount of porous space which is under that section, the average pore space in that section and multiply that by the area which the section covers, which we assume will be productive, and divide that by 5.6, which is a conservative factor of the cubic feet per barrel, that then gives us the amount of porous space which will probably contain oil or gas in the whole field. That is known as the porosity method and is used sometimes.

(2) We have another way of getting at the reserve and that is by calculating the amount of gas which has been produced out of the field, knowing the original pressure and the pressure at the present time, dividing the total production by that pressure drop, giving us the amount of gas which is produced for each pound of pressure drop and then multiplying that by the total pressure in the field, that then gives us the total amount of gas we might expect in the field. That is simply the application of one of the natural gas laws which has been fairly definitely proven and is a fairly accurate method. That however really gives the contents of the gas horizon only.

Then we can apply the same method to the oil reserve, that is, taking the amount of gas which was produced, convert that into barrels of gasoline, adding this quantity

to the total barrels of oil and naphtha produced and dividing that by the pounds of pressure drop which has occurred---------- that gives us the barrels of displacement per pound of pressure drop and that multiplied by the estimated bottom hole pressure would then give us the total amount of barrels of oil which is represented. Then it is necessary in using that method to assume that these wells drain a certain particular area which of course then gives us the figure over the area, and that multiplied by the area which we think would be productive would give us the reserve. There are the three methods and my calculations involve all three. I could take that method and use that, but the figures I got on my interpretation and the result is my basis of comparison for my final figure.

In making these calculations it is necessary to have some fundamental figures on which to go and I will give you those figures now. The gas area in my calculation has been taken as the area lying above the minus 2000 foot contour line. That simply means if we would draw contours on the top of the lime, the 2000 foot contour line from the ore up is estimated to be the gas area in the field. The reason for that is this. I might take Advance 5A well which is located right here in the field. That field came in originally as a gas well and the top of the lime in that well is fairly close to the 1800 foot contour line on top of the lime. That well produced about 3 years, between 3 and 4 years, before it started making oil. It is one of the wells where the oil migrated up structure and it is now making oil. It seems reasonable therefore to assume that the 2000 foot contour line was the reasonable

place at which to put the original gas-oil contact. There are several other wells which might be cited as criteria for that.

Q MR. FRAWLEY: Gas-oil contact, what does that mean.

A That is the point in the formation where the gas meets the oil level. If we take the field as a whole we have gas in the upper part, oil in the lower part and then water still below, still lower, in other words there are three layers in a comparative section of the lime, the first is the water and then oil lying above that then gas lying above that. It is purely the result of experience. Gravity starts in. The gas is the lightest and goes to the top. The oil is next and then the water below.

Now using that 2000 foot contour line and the place of the fault on the other side, and counting up the acres on that section clear from the North end of the field clear to the South end, I found approximately 10,200 acres, and for the purposes of this valuation I have used the figure 10,000 acres. Now in the oil area we have several figures, and it might be well, Mr. Frawley, if I could have those now.

Q MR. FRAWLEY: You might describe them and we will mark them.

A I have here three maps which represent the South, Central and Northern parts of the Turner Valley Field and upon which has beenplotted the various oil and gas producing wells, the tracing of the fault on the East side at the point at which it meets the limestone and cuts off the producing part of the field, and upon which have been traced

contour lines at intervals of 500 feet from the point, minus 1500 feet below sea level, to a point 5500 feet below sea level.

Q We had better mark these separately, start at the Northern end?

A Yes.

Q Then this map which you have described, that section of it dealing with the Northern Turner Valley will be Exhibit "3".

(Map showing Northern part Turner Valley here marked as Exhibit "3").

MR. FRAWLEY: Then the map of the Central section will be Exhibit "4".

(Map of Central section marked Exhibit "4".)

MR. FRAWLEY: And the map of the Southern Section Exhibit "5".

(Map of Southern section marked Exhibit "5").

Q MR. FRAWLEY: Now those are maps on which you have shown the three areas which you are about to describe?

A That is correct.

Q I am anxious that the commission should understand these maps quite well and you might want to go into them a little more closely perhaps at a little closer range.

A Yes, I thought I would take up Exhibit "5" as an example and all three maps are drawn on the same general plan.

Q You might perhaps usefully bring that a little closer if you like.

A All right, these maps represent the Southern portion of the Turner Valley Field and break off at about this point, between Southwest No. 2 and Miracle No. 2, the line

that cuts off the North end of the map would be a line running right through between Southwest No. 2 and Miracle No. 2. The section lines on the map correspond with the section lines.

On this map the sole fault or the fault which bounds the Eastern limit of the field intersects the limestone as shown by these cross-sections at the outside line here which is shown on this map by the North Easterly line which is dotted, that is, the trace of the fault at the point at which it meets the limestone. Of course that happens down below but this line is vertically projected up to the surface and is shown as a tracing on the map on the East side. The wells are all marked in their proper location and the elevation of the top of the line at each well on which we had good data are marked. The contour lines are drawn at 500 foot intervals and their position were determined by means of the elevation between any two known wells. Inother words, if one well had an elevation of 1800 feet and another had an elevation of 1200 feet then there would be half way between those two wells would be the approximate position of the 1500 foot contour line. And that is the way in which all these contour lines were drawn. They are based of course upon known wells wherever possible. It has been necessary however to extend those lines in cases where we did not have wells as criteria, that has been done, and this map is my interpretation of what those contour lines represent.

There is this gas area. Then the gas area as marked on the plotted part of the two thousand foot contour lines. The sole fault marks it on either side and this map, . of course only shows the portion of the two productive areas, carrying that yellow on clear up to the other end. That has an area of nearky 10,200 some acreas but for purposes of my calculations I have assumed a close figure of 10,000 acres.

Q The yellow area is the gas area?

A That is correct.

Q Sometimes called a gas cap?

A That is right.

Q And comprises about 10,000 acres?

A That is right. The Oil area is shown in green and lies between the two thousand foot cont lines on the four thousand foott contour lines. That area also comprises about 10,000 acres. The actual figure I believe was 10,418 but for the purposes of this calculation I use the figure 10,000 acres. Then the area marked in blue represents the possible oil area and amounts to about 5,000 acres. This production in my estimation is problematical. This I feel is fairly well assures.

Q You say this production in my opinion is problematical. You are referring to what you call the blue area?

A That is correct. The purple area represents an area, a productive area which is only possible. The green area represents what I believe will be an actual productive area of the field, oil productive

area of the field.

Q And the yellow one?

A The yellow, the gas which is already proven throughout it's length and breadth. To summarize then, the gas area amounts to 10,000 acres; the oil productive area amounts to 10,000 acres and the possible oil productive area amounts to an additional five thousand acres or a total possible productive area of fifteen thousand acres. In other words in generalizing it for the field it means, in my opinion, twenty thousand acres in the field will be productive of either oil or gas and being divided half and half. The possible field outlined will include about 25,000 acres, 15,000 of which will be oil, and 10,000 of which will be gas. Now in making sub-surface measurements, it is necessary to take temperature into consideration. The temperature records are not complete, but it seems reasonable to say that a temperature of about 150 degrees F. is in the formation, that is the temperature of the formation t the point where oil and gas are found is about 150° and that is the figure I have taken throughout my calculations. As gas is heated it expands of course, and changes its pressure and volume and it is necessary to take temperature into consideration in figuring the underground reserve. In these calculations I have used the figure of 150° which I am told has been found in some wells. Not a great many temperature measurements have been taken in the field. It is also necessary in making these calculations to determine the bottom hole pressures, and in going

through the records of course the field had produced for a long time before any good pressure records were available. However, the figures I have obtained here are the minimum and they were probably somewhat higher at the beginning of the field's life, although we have not very much data to go on. I had to take the best information that was available. That figure amounts to 36 pounds per one hundred feet of depth below the surface elevation of four thousand feet. That was found in this way. Royalite No. 30 which is an oil well, encountered the top of the line at 7,220 feet, and had a bottom hole pressure of 2,660 pounds. That meant that the average position of the horizon, that is an average of 225 feet below the top of the lime that there was 2660 pounds pressure. That point at 7400 feet below the surface elevation of 5,000 feet, the actual evevation of the well was 4,250. In other words the point which the average pressure would occur at that horizon then, was at 7,650 feet. But its position four thousand feet above the surface was only 7400 feet. Divide 2660 pounds by 7400 pounds gives a figure of 36 pounds per one hundred feet below a datum plane of 4,000 feet above sea-level. In other words, that is the method of calculating bottom hole pressures and in doing that you must take some particular point in the formation. You have to take some particular reference points on the surface and the reference point which I took was 4200 feet above sea-level. I found that the Royalite No. 30 had a point 7,650 feet from the top of the hole, the point at which this measurement was made

This meant that the average increase in pressure was 36 pounds per one hundred feet giving a pressure at that point of 2660 pounds. Merland Nol 1, a gas well, had an initial pressure on the surface of 1885 pounds. Now the pressure in the bottom of the hole would increase as we go down in that gas column because gas has weight. There again in calculating to the top of the oil horizon I find that there is 36 pounds per one hundred feet. Now these wells were completed later in the life of the field and it is probable that the original bottom hole pressure exceeded that. Now the average gas pressure using these figures and taking the average gas cap pressure as being 2123 pounds at approximately 147 atmosphere. Now that atmosphere is simply the amount of pressure there happens to be and for that purpose I have used a 14.4 as being the atmosphere. In other words, the pressure and atmosphere of gas will if confined, every increase in pressure of 14.4 pounds decreases the gas column in that same proportion. In other words, if we have a box of gas here a foot square, and it is under atmospheric pressure which is 14.4 pounds, and we increase that pressure to 28.8 pounds, there will only be a half a foot of gas. If we multiply that atmosphere by three there will only be one-third of gas and so on. One hundred and forty seven atmosphers means that the gas that comes out of the surface while it was actually underground only occupied a 147th part of the volume that we see on the surface. Bottom hole pressure is referred to a point which is 950 feet in depth below 4,000 feet. In other words, I said the gas

average pressure occurred at a point 950 feet below sea level and the original bottom hole pressure of the whole area I calculate to be 2640 pounds at a point 7300 feet below the 4,000 feet above sea level. The reason for that is easy to see. The average oil field has a closure of about 4800 feet. In other words, there is about 4800 feet elevation between the lowest part of the field and the top. That is almost a mile high there in that field. The oil is in a considerably different position than gas. I assume the average pressure in the oil horizon is represented at a point 7300 feet below the 4,000 ft above the surface or 3300 feet below sea level with the gas area of the other point which was 4950 feet. Now in working out the oil reserves upon the basis of displacement it is necessary to know the gas-oil ratio and in calculating these gas-oil ratios I took the figures which the Conservation Committee uses for allocating production. I found in there for allocating, that there were a number of wells located between 1700 and 2000 feet contours that had excessively high gas-oil ratios. They were of the order of from 4000 to 20,000 feet per barrel and that below that line the majority of the wells had less than 4000 feet per barrel ratios. So in attempting to determine from that basis the amount of oil in the ground I arbitrarily took or considered only the wells that give oil-gas ratios of less than 4000 feet per barrel. In doing that I used all the wells which had 4000 feet per barrel oil-gas ratios or less. I found that the average gas-oil ratio of those was 1700 cubic feet

per barrel. In the gas zone, the original ratio was about 35,000 feet per barrel. Minimum figures as low as 20,000 per barrel were found and maximum figures ran clear out of sight. Now inddetermining the porosity of the oil horizon, I have already gone through that. As I said I found that there was an eight foot porous section in the horizon. As far as the gas horizon is concerned the records are incomplate and there was not enough porosity data on the gas wells to draw any conclusions from the porosity method. We had to eliminate that in the gas area. Now as I told you the production to date was assumed to be 13,000,000 barrels in making this calculation. I found in calculating the gas reserves there is one trillion four hundred billion cubic feet of gas originally in the formation. That figure was determined by the so-called pressure-drop method and the supporting data is as follows:- Total gas production during 1937 amounted to nine hundred and sixty billion cubic feet of gas, referred to 14.4 pounds per square inch and 40° F. Now that is the total amount of gas that was produced. During that period there were two million seven hundred thousand barrels of oil produced which had presumably an average gas-oil ratio of approximately 3,000 feet per barrel, giving a total gas production from the oil part of the field of about eight billion cubic feet of gas. That is from the area about the 2,000 contour line, the amount of gas produced was 953 billion cubic feet of gas. Now during that production the bottom hole pressures dropped 14.75 pounds. I might tell how I determined

that pressure-drop. The pressures in the various gas wells were plotted in the form of a curve clear across the field. That is a map was taken which is similar to this map here, and in all of those gas wells pressures were plotted in lengths of line giving a pressures profile clear across the field and the pressures were averaged for each section, and those figures were added together and averaged for these seven sections. That gave a figure of 650 pounds as the peak pressure, weighted pressure of the gas cap at the end of 1937. The original pressure was 2130 pounds and striking the two give me a division which actually amounted to 14.75 pounds as being the actual pressure drop in that horizon. Dividing the gas production by the amount of pressure-drop showed approximately 65,200,000 cubic feet of gas was produced for each pound of pressure-drop and 64 billion cubic feet of gas was produced for each 100 pounds pressure-drop. Multiplying that by the original pressure in one hundred pounds which was 2123 pounds gives the figure of one trillion, three hundred and eighty-four billion, one hundred and ninety-six million cubic feet of gas. For the purposes of this estimate I have assumed that means one trillion four hundred billion cubic feet of gas. That means that in the future there will be produced in the field something like four hundred billion feet of gas, in other words, the field is about two-thirds produced as far as gas is concerned. Now in arriving at the naphtha reserves in the field, the old records showed that the field was capable of doing, the base figure

on the naphtha recovery from the gas in the fields during its early life amounted to about 35 barrels per one million cubic feet, and in high pressure fields such as this it has been our experience with gasoline plants that only about 70% is actually recovered, even under the best operating conditions. That means then that there is about 30% still left out. Analyzing these figures I estimate that the original recoverable or the original total amount of naphtha and gasoline in the natural gas amounted to 50 barrels per one million cubic feet, which gives a reserve then of 70,000,000 barrels of naphtha and gasoline. That amounts then to 7,000 barrels per acre for 10,000 acres in the field, in the gas part of the field. My estimate of the probable recovery under methods that have been used here amounts to 20% or 14,000,000 barrels, of which you have already produced about 9,000,000 barrels. In other words, the percentages there are very close to the percentages of the gas that has already been produced. In other words there is about two-thirds of the naphtha and gasoline gone and about two-thirds of the gas has gone out of the field.

Q What did you say in barrels, 20% recovery?

A The 20% recovery will give us about 14,000,000 barrels. That is the figure I have used for an examination of the naphtha production from the gas cap itself. Now it might be as well at this time to give a little discussion on that, the low recovery of gasoline and naphtha. On the gas part of this field the gasoline and naphtha was in the vapour phase. It is not in the liquid phase at

all, it is all in the gas phase. This gas was under a pressure of approximately 2100 pounds, and we have found within the last few years that our physical laws reverse themselves after we get above pressures of approximately 800 to 1000 pounds. In other words, the old gasoline plants were operated on the principle that if they could compress the gas and cool it that brought out gasoline. After you get above 1000 pounds the reverse phenomenon occurs. In other words, if we have gas under two thousand pounds pressure and drop the pressure, some of this gasoline will come out, which is exactly the reverse of what happens at the lower pressure. That is called retrograde condensation. The temperature effect is exactly the same throughout the whole pressure range, that is if you decrease the temperature you knock down more gasoline whether you are in the retrograde or not. In the upper range, that is 1,000 pounds, at least, retrograde condensation occurs. Here is what that means in terms of Turner Valley. The pressure has already dropped below 1,000 pounds and that means that every time you reduce that pressure in the formation some of that gasoline that was in solution, or in the vapour phase in the formation, drops out as gasoline and stays right in the sand, and that then is unrecoverable. The gas comes on out and turns to gasoline by your change in temperature and pressure and is brought out in the separator, but what was deposited in the reservoir cannot be gotten out. Probably in Turner Valley at least 50% of the original gasoline and naphtha content was dropped out in the reservoir, and probably will not be recovered

except by some sort of re-pressuring operations, and even then only a portion can be recovered. That accounts for part of the loss. Then, of course, inefficient separation and the fact that a great deal of gas is not treated in gasoline plants accounts for that. My estimate of the oil reserve amounts to 171,000,00 barrels of oil. That is obtained by the following method: That means 31 years' supply at 15,000 barrels a day. Now in arriving at that figure I used the following method. That method is known as the porosity method. The average porous section taken from the well logs amounted to 170 feet, the average porosity being five per cent. That meant then that every section of that limestone had eight feet thickness of pore space which was all voids there. In other words there is an eight foot cavern in effect for the storage of oil, gas or water. I assume that the saturation be 100 per cent with the temperature of 150° and the gas-oil ratio at 1700 feet per barrel - and you will remember that I told you that I obtained that figure by taking all of the wells which had gas-oil ratios of less than 4,000 feet per barrel. Now then that gives a formation factor of 55%. In other words, that means this, that in that eight feet of section only 55% of it had oil in it. The rest of the space was taken up by gas in solution in the oil and gas up above the oil, and it also took into consideration the fact that the temperature was about 110° or 20% above the 40° reference temperature that was used. I estimate that 50% of that oil would be recovered and that gives me the following figures. Multiply eight feet by forty-three thousand five hundred and

sixty gives the number of cubic feet of space per acre of area. In other words, we have 43,560 multiplied by eight and that is divided by the figure 5.6 which is the number of cubic feet in a barrel and that then gives the umber of barrels per acre in the oil horizon. That worked out to be 62,230 barrels. In other words, that means that there are 62,230 barrels of space under each ~~area~~ acre of the oil part of the field. Using the figures that I have given you, fifty-five per cent of that being the field of oil, if we multiply that 62,230 by fifty-five per cent, that amount then gives us the amount of oil under each acre of oil land, and if we multiply that by the percentave that will be recovered, which I assumed was fifty per cent , that total figure was 17,113 barrels per acre which represents the amount of oil that can be obtained from each acre of oil land. I am applying that figure of 17,000 barrels per acre to the area which I believe will be productive, 10,000 acres which gives a total underground reserve of 170,000,000 barrels. Add to that 14,000,000 barrels of gasoline and naphtha originally in place in the gas gives a figure of 184,000,000 barrels of a total gasoline, naphtha and oil production to be expected from the field of which 13,000,000 barrels have already been obtained, leaving the total ultimate reserve as of the 1st of January, 1938, of 171,000,000 barrels, or as I told you that gives us a 31 years' supply at 15,000 barrels per day. Now if possible reserves were taken into consideration, of course, that figure would be increased fifty per cent, because all of the fundamental figures would be exactly the same and it would be simply an additional figure

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of five thousand acres, so we would add fifty per cent to the figure 171,000,000, which would give a figure of 256,000,000 barrels of oil, possibly obtainable from the Turner Valley Field.

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Q Dr. Boatright, or Mr. Chairman, do you feel that you would like to rest a bit. He has been talking about a difficult subject now for about an hour and a half.

THE CHAIRMAN: Yes, I see there is a chair there, would you prefer to sit down?

WITNESS: No, I think I prefer to stand, but I would not object to a five minute recess.

THE CHAIRMAN: Very well.

(The Hearing was adjourned for five minutes).

WITNESS: Mr. Chairman, in supporting these figures I used these other two methods of course, and the figures which I have given you I feel are minimum figures. To show that I will go into these other two methods and show the figures which I arrive at by those methods, and show what they mean in interpreting the method which I used.

The first is the pressure drop method used in the oil horizon. In working out the reserves by that method it was necessary, of course, to use a certain amount of fundamental information which was as follows:- There were there about twenty-nine wells which were completed in 1937 and 1938, and which represent about fifty-six thousand and seventy-one days, or about fifteen a half years in all, and averaging two hundred days per well, I find that the average pressure drop per well was three hundred and twenty pounds. That, of course, was determined by the bottom hole pressures originally taken, the amount of production which had occurred between that time and the time the last bottom hole pressure was taken, of both gas and oil, and that averaged three hundred and twenty

pounds or about 1.6 pounds per day. The oil produced by these twenty-nine wells during that time amounted to approximately two and a half million barrels. The amount of gas produced during that time, referring to the average bottom hole pressure conditions, during the time that that production occurred, amounted to 23,300.000 barrels of displacement in the reservoir, or a total displacement in the reservoir amounted to 25,800,000 barrels. Now that simply means this, that during the time that the pressure in the twenty-nine oil wells decreased three hundred and twenty pounds, there was an actual amount of space in that reservoir which was occupied by both oil and gas amounting to 25,800,000 barrels, was taken out, dividing that 25,800,000 even by the three hundred and twenty pound pressure drop, would give you a figure which would represent the amount of displacement out of the reservoir for each pound of pressure dropp That amounts to 80,600 barrels displacement per pound of pressure drop. Multiplying that even by the total amount of pressure in the reservoir at the average pressure pound of the reservoir, which is minus 7300 feet below the elevation of 4000, shows that there is approximately 212,000,000 barrels of oil represented by those twenty-nine wells. Now, if we assume that each one of those wells drains forty acres, that then means that there will be 183,000 barrels per acre of initial reserve, that is almost three times the figure which I actually used, which was 62,000. Putting that in another way then, if my estimate of productive acreage was three times too high, I would still justify on this basis, would still justify my figure of thirty-one

years, or 71,000,000 barrels yet to be produced.

Without going into the details of the gas which involves deviation from Boyle's Law and temperature, I did the same thing with the gas area and found that in the gas area the barrels of displacement, or the total barrels of displacement represented by the total pressure in the gas horizon amounted to 173,000 barrels per acre, which also is almost three times the figure which I actually used.

While I used the porosity basis I used it because it was the most conservative. In the event, however, that I was too optimistic concerning the amount of productive acreage, I could still use these other figures which check fairly closely, within seven per cent, one hundred and seventy-three and one hundred and eighty-three thousand barrels per acre, and still only use one-third of the space which I have actually assigned to the productive oil acreage.

I believe that covers the work which I have done. It might be well in closing merely to summarize what these figures mean. I have estimated the gas reserves at one trillion.....

Q MR. FRAWLEY: Justas slowly as you can, Doctor.

A The gas reserves at one trillion, four hundred million.

Q When you say four hundred million, do you mean that, with that drop there?

A Four hundred billion, I am sorry, one trillion, four hundred billion cubic feet. That means that originally in the gas-cap of the Turner Valley Field, amounting to approximately ten thousand acres, there was originally

a gas reserve of one trillion, four hundred billion cubic feet, of which, as of January 1st, 1938, approximately nine hundred and fifty-two billion cubic feet had been produced. Putting those figures in other terms, it means that there is a remaining reserve in the gas-cap of approximately four hundred and fifty billion cubic feet of gas, so that approximately two-thirds of the total gas reserve in the Turner Valley Field has been produced to date.

The naptha reserves were estimated to be fifty barrels per million cubic feet of gas originally, and they were contained in the gas reservoir in the vapour phase. Multiplying the fifty barrels per million by the gas figure of one trillion, four hundred billion, gives the original naptha reserve of seventy million barrels. "Naptha" is used in that statement referring to both the true naptha and the gasoline which is recoverable by absorption methods. It is my estimate that about twenty per cent of that reserve will ultimately be recovered from the Turner Valley Field, because of the inefficient methods which have been followed in the past, and the peculiarity of the action of natural gas and naptha under high pressure. This then means that there was originally in the gas-cap of the Turner Valley Field, fourteen millions barrels of recoverable naptha and gasoline, of which approximately ten million barrels have already been produced, leaving a remaining reserve of approximately four million barrels of naptha and gasoline.

Using a loose and most conservative method in estimating the oil reserves, I found that there was originally contained in the oil reservoir at least a hundred and

seventy million barrels of crude oil. Adding to this amount the estimate fourteen million barrels of naphtha and gasoline, so that again there was originally a hundred and seventy-one million barrels of crude, a hundred and seventy million barrels of crude in the oil part of the reservoir, and adding to this the fourteen million barrels of naphtha and gasoline which may reasonabley be expected from the gas-cap, gives a total of a hundred and eighty-four million barrels of total liquid which may reasonably be expected from the Turner Valley Field. Of this total of a hundred and eighty-four million barrels, there have already been produced thirteen million barrels of crude, naphtha and gasoline, leaving a total present reserve as of the 1st of January, 1938, of a hundred and seventy -one million barrels of crude, oil, naphtha and gasoline. If we assume that the average production per day, which is necessary to satisfy the average demand for crude and crude products based upon the last year, amount to fifteen thousand barrels a day, this supply of crude, naphtha and gasoline will last thirty-one years.

MR. FRAWLEY: Thank you very much.

THE CHAIRMAN: Any questions?

Q TO MR. NOLAN: There is just one thing I want to ask you, Dr. Boatright, if I might, all of these conclusions to which you have come have been based for the most part on assumption, Doctor?

A No. I would not put it that way. They are based upon the records of the Canadian Geological Society.

Q Well take the question of acreage for example, you were good enough to tell us during the discussion there were ten thousand acres in the oil area coloured green?

A That is right.

Q That is an assumption?

A That is my interpretation of the top of the lime bed which were taken from the Canadian Geological Surveys.

Q Yes, but to those of us who do not understand these things, we sometimes think it may be difficult to know what there is below the ground?

A That is correct.

Q That is very correct, because some people who go below the ground, who drill, are very seriously disappointed?

A That is true.

Q In spite of the advice which they get from technical experts.

A That is right.

Q That is corret is it not?

A That is so.

Q When you say there are fifteen thousand barrels necessary for market requirements, you are putting that on the basis that there will be a steady market of that character, of that amount, unchanged in the future?

A That is correct, and I might explain that the real market by which, of course, what you have in mind I think is we will . , I believe you increased it by 5.9 per cent last year, that is the difference between 1937 and 1938, and in the United States it amounted to about 8 per cent.a year of in crease in consumption.

Q Doctor, you say in the future the increase in the consumption of oil, it will increase annually by eight per cent?

A That was the figure for the United States. Your figure for last year here was, I think, 5.9 per cent, something of that order. The previous year I think it was ten something. But if we go into consumption we immediately get into the

development of new reserves. We get into the development of other pipelines and those things, which seems rather ridiculous to start something like that, you are in the realm of the unknown. You are predicting things ahead that cannot be taken into consideration, and that is the reason I used the figure for the last year, which seemed to me the reasonable thing to use.

Q You say as we go into the question of other reserves, we get into the realm of the unknown?

A The development of unproven fields, that is the development of the whole area of Alberta.

Q I do not suppose in the time at your disposal you have much opportunity of considering other potential reserves in the Province?

A No, not to any detailed amount. I do know, however, from a study of the geology of the structure, the geology and the area, that there are very good possibilities of other fields being developed, and that there are other fields here of which I do not have any knowledge.

Q My assistant, Dr. Boatright, talked to me about the Sweet Grass Arch, what does that mean?

A I am not familiar with that.

Q You know enough about the geological structure in this Province to know that there are other potential fields?

A I think so.

Q But what I am interested in is the pipeline?

A Certainly.

Q And further, what I am interested in is how long that pipeline is going to be of any use to me?

A Yes.

Q And that might depend, as I understand you, on what other reserves there were found in the Province.

A Yes, it is going to depend upon the demand from the Turner Valley Field, which in turn is going to depend upon a lot of factors.

Q Yes?

A But it seems to me in arriving at the figure for the Turner Valley, that these other unknowns which we admit cannot be evolved; that it seems most reasonable to use the figure which we know, and which is reasonable, which is fifteen thousand barrels a day figure.

Q Which is the figure which we know?

A Yes, which is a factual figure, yes, for the previous year.

Q Something which we can bite into and know about?

A Yes.

Q But, Doctor, this might happen, is it not a fact, that drilling in the Turner Valley is most expensive?

A It is very expensive, yes.

Q My information is that a well costs on an average about $165,000.00?

A I think that is a very fair average.

Q Do you know in your experience of any areas where well drilling is more than that, on this Continent, shall we say?

A On the average, no.

Q That is a high average?

A It is a fairly high average.

Q Well, if another field were found with cheaper drilling, you know what I mean?

A Yes.

Q Production at a lesser depth?

A Yes.

Q That might have a very serious effect on the Turner Valley situation?

A Yes, it might to a certain extent, but there is this about Turner Valley, you have a marvellous original pressure there. The original was very marvellous, and even in spite of the depreciation which has gone on in the past, it is still marvellous.

Q But it costs a lot of money to get it?

A Yes, but you remember this, you must remember this, in Turner Valley the allottment is forty acres to a well, and in numerous instances which I can state, wells costing fifty to sixty thousand dollars are given only ten acres. That means a well of forty acres divided into a hundred and sixty thousand only costs $40,000.00 for ten acres. That is a common spacing in the United States.

Q But the fact does remain it costs $165,000.00 to get down to production?

A That is so.

Q Now if drilling could be carried on more cheaply in other parts of this Province or in other parts of other Provinces, it might affect the Turner Valley situation to the point that it might not be economical to drill for oil in that Valley?

A Well I think in making that statement we are getting into the realm of the unknown, and it has been our general experience that where aknown field is proven, that there are interests there that go ahead and develop that field as a general rule. I do not know of any field in the world which was partially developed and then abandoned because some other field was found that was cheaper to develop. If we applied that argument to the oil field as a whole, it would be a serious thing because we have production from fields with wells down to 15,005 feet. If we applied that argument to the United States where the experience of course has been much greater than it has here, it does not seem very logical.

Q We have over-production in the United States?

A Yes, and they are still producing it in spite of that, and they are producing it from these deep fields from 15,005 feet they are still producing, and if your argument was applied to that they would not be producing.

Q. You will go as far as this, will you, that it is unknown what the oil potentialities are in this Province?

A Yes.

Q You cannot tell?

A We cannot tell.

Q And that will have some effect on the Turner Valley?

A That will have an effect on Turner Valley.

(Go to Page -154-).

Q And that in turn has affected the pipeline, which is the thing that I am interested in at the moment?

A That is true. It might very well be that it will affect it just as much one way as the other, if we are going into the realms of supposition. It might improve the situation instead of working against it.

Q But we do not know?

A Therefore I say we should eliminate that, and use my fact figures, based on these Exhibits.

Q You said 50% of the oil in place would be recoverable?

A That is the figure I used.

Q Is that not a high figure?

A No, it is not high. I will tell you we have had a great deal of experience in fields with pressure similar to this here. In fact I personally have worked in pressures approximately 50% higher than these, and I know what these recoveries are. I know this, that the 25% figures that you use do not take into consideration the gas phase. My figure of 50% recovery that you think is high, is .275, which is 27½%, and I multiply by .55 which is my formation factor. In other words, I have taken into consideration the fact that the gas in reservoir occupies approximately 45% of the space and the remaining .275 multiplied by 62,000 barrels per acre gives a figure of 17,000. In other words, the recovery figure will vary with different engineers. In my particular case I considered the gas that was in the oil in the formation.

Q Now you said something about water-drive, that I am not at all clear about. Let me put it in the simplest way

I can think of. I do not understand these things. What brings oil to the surface?

A In the Turner Valley Field the statement that I made was this that in my opinion the thing which you were going to have to depend upon in order to produce oil was the energy contained in the compressed gas in the reservoir, plus a slight amount of gravity drainage during the later stage of life of the field, after the pressures decline.

Q Where is that compressed gas on which the oil depends for its motive force?

A It is in several forms, but it occurs in the top of the structure in a gas phase purely. At the gas-oil contact there is gas in the gas phase and there is gas in solution in the oil. There is gasoline, which is in the liquid phase in the oil. which has been dropped out, and dropped into the oil because of the pressure and there is gas adhering to the face of the sand grains. Those are the sources.

Q It is this energy supplied by the gas which raises the oil and causes it to come to the surface of the ground?

A That is right.

Q If you had a water-drive you then would not be depending upon your gas energy to move up the oil would you?

A No. If you had a water-drive. Now let me clear up point right here. We know that there is water along the edge of the Turner Valley Field. There is water there, no question about it. They have found it in Okalta Six. The co-efficient of expansion of water is about one part in twenty-two thousand per atmosphere. Now applying that factor to the water at the edge of the field, there is that flow of one mile of width of that water down the structure, and that it will expand under that twenty-five

feet for each, I believe it is, one hundred pounds pressure. In other words, there would be water effect although there would not be any true water-drive. A true water-drive assumes that the water will stay under in a body and come under as the pressure decreases. This effect I am talking about would affect it for a short time only. The water had expanded simply due to the released pressure, and would only migrate so far and stop.

Q A water-drive will supply energy or motive force or power behind it to bring the oil to the surface?

A It may.

Q It does in certain instances?

A It does in certain instances. I think undoubtedly in the case of the Turner Valley Field that there will be some slight water-drive effect, but it will not be anywhere near the effect that you would expect from an ordinary water drive. There will be a slight effect there.

Q So that in the result then, we are depending to a large extent upon the energy contained in the gas in the structure.

A Yes, primarily.

Q To bring the oil to the surface?

A Yes, that is right.

Q MR. FRAWLEY: It is clear, Dr. Boatright, is it, that 171,000,000 barrels of crude naphtha and gasoline are recoverable?

A They are recoverable as of January 1st, 1938.

Q And amount to about a 31 years' supply?

Q MR. NOLAN: That reminds me there that your figures were up until and including the 1st of January, 1938?

A Up through to the end of December, 1937. In other words,

they start in as at the 1st of January.

Q Of this year?

A Of this year.

Q MR. FRAWLEY: You have supplied Mr. Morrison with the figures that you have, and in a rough way with the evidence you have given this morning?

A That is correct.

MR. FRAWLEY: If there are no more questions, that is all. Thank you. Mr. Nolan will now make some answers to Dr. Boatright's evidence. We have thought it was proper that I should call the witnesses, all the witnesses in this Commission, and therefore, I am now calling Dr. Link, and Mr. Nolan will deal with the witness.

MR NOLAN: I was wondering, Mr. Chairman, whether you wanted to go on with a new witness at this time. My reason for asking is this, we have maps which we wanted to set up, and put in such position that you can see them, and we thought we could do that during the adjournment.

THE CHAIRMAN: You prefer that we should rise now.

(At this stage the hearing was adjourned until 2 P.M.)

.....

2.P.M. Session

THE CHAIRMAN: Mr. Frawley, you said something about the difficulties which you might experience in cross-examination because of the particular nature of the evidence.

MR. FRAWLEY: Yes, Mr. Chairman.

THE CHAIRMAN: And you have thought of perhaps one witness examining another?

MR. FRAWLEY: Yes.

MR. CHAIRMAN: It seems to me there is force in what you say and I just wondered, Mr. Nolan, if you would like to have Dr. Link examine Dr. Boatright.

MR. NOLAN: Yes, perhaps I might be permitted to speak to him about that very thing. I do not think that will be necessary because Dr. Link thinks that by what he is going to say he will in effect answer the questions which might now be put to Dr. Boatright.

THE CHAIRMAN: Very good.

MR. FRAWLEY: Call Dr. Link.

.....

Dr. Theodore August Link, having been first duly sworn, examined by Mr. Frawley, said:-

Q Dr. Link, you are connected with the Imperial Oil, Limited, or the Royalite Oil Company, which is it?

A Both.

Q In what capacity?

A Geologist in charge of Western Canada.

Q And what are your qualifications, Dr. Link?

A I was graduated from the University of Chicago, 1918, Bachelor of Science Degree. From the same University

C-3-2
DR. THEODORE AUGUST LINK

1927 Doctor of Philosophy; after graduating in 1918 I worked for the Canadian Geological Survey in Quebec and British Columbia as assistant geologist. From there I went to Ranger-Texas as geologist for the Empire Gas and Fuel ... In 1919 I joined the Imperial Oil Limited as geologist and worked for them in Nova Scotia, Alberta, North West Territories, British Columbia, and Saskatchewan. In 1922 I went to South America, Colombo, South America, where I was geologist in charge until 1926. During that time I worked on coastal area of Colombo and also in the oil field 400 miles up the Magdalena River. Then between 1926 and 1927 I went back to Chicago and got my doctor's degree as already stated. In July 1927 I arrived here in Calgary and have been with the Company at this work ever since, exploring for oil fields in Alberta and adjoining territory and in charge of all geological work with respect to Turner Valley. I had a leave of absence for seven months in this period when I was engaged, in charge of designing and construction of the petroleum industries exhibit for the World's fair at Chicago in 1933.

Q MR. NOLAN: Now, Dr., I understand you have prepared a report which I may be allowed to call the geological background necessary to arrive at an estimate of the reserves in the Turner Valley Field?

A Yes.

MR. NOLAN: Mr. Chairman, with your permission, Dr. Link will tell this to the commission in his own way

as was done this morning, and again with your permission if you should so desire a typewritten copy of his report will be left with the commissioners and marked as an exhibit or not as you prefer. There will be certain documents and maps put in as Dr. Link will go along and I think we will interrupt him and have these marked as the necessity arises, but with this witness and other witnesses who will be called, they have reduced their evidence into the form of a report, and it occurred to me, I have not discussed it with Mr. Frawley, that it might be of assistance to the commission to have the report separate rather than have to read it out of the transcript, that is to have to read what the report contains from the transcript of the evidence.

THE CHAIRMAN: Yes.

Q MR. NOLAN: Well, Dr. Link, will you then proceed to give us what we call the geological background?

A Before beginning I would like to compliment Dr. Boatright on his excellent presentation this morning. As he told you he has been here only several weeks and his geological interpretation is based upon that of other men who have worked here and I think he has made a very good presentation. He has also presented the engineering aspect in a very able manner but since I do not pretend to be an engineer I will not try to discuss that part of his presentation. The main part of my presentation will be to call attention to some of the

things which I think he has omitted and which are important to consider from a geological standpoint. I will base, at the end of this report I will give you what I think is the first estimation on reserves on the basis of geological information and I will confine myself to what we actually know and what has been the record to date, not on what we may think will happen. If you do not mind I will read most of this report and if you see anything which you may wish to ask me about, you may stop me and ask me to explain, in case I go too fast. From a geological standpoint there are several factors which are needed to arrive at an estimate of crude oil reserves in Turner Valley. They are as follows:

1. The structure of the field.
2. Area of the field divided into gas-cap, crude-oil area and the edge-water.
3. Thickness and nature of the producing formation. Now the nature of the producing formation is divided into:
   (a) Porosity, this will all be explained.
   (b) Permeability.
   (c) Fracturing.
4. The pressure at which the oil is found in the formation and its rate of decline.
5. The effect, if any, of the edge-water on the pressure.
6. The rate of crude oil and gas production.

Now I will say Dr. Boatright has covered a great number of these already. The object of this discussion is to point out what is known about the above enumerated factors, with the hopes of arriving at a basis with

respect to the oil reserves of the Turner Valley structure.

Before entering into this discussion it is important to appreciate the differences between the total possible amount of oil in the formations and the total possible recoverable oil. Obviously oil which cannot be drawn from the formations need not be considered, regardless of how large the figures are. This discussion will, therefore, be confined to the recoverable reserves. What we think we can get out.

Now the structure of the Turner Valley Field stated briefly. I brought along a section here which was omitted in this report. It is the anticlinal structure. Now the anticlinal structure is generally what is observed as the location. It is seventeen miles long as you can see here and practically two miles wide. It is bounded on the East side by a large thrust fault called the major sole fault. Along this fault plane this anticlinal structure was moved eastwardly an unknown distance, you see. I do not know far but it does not matter anyway. The structure therefore is disconnected from the rocks to the East, and whatever takes place over there has no connection with Turner Valley whatsoever. To the West the possible crude oil area is bounded by what is termed "edge-water". Now Map No. 1 here.

Q MR. NOLAN: Just what is edge-water?

A Edge-water is regarded as water which is down the flank adjoining the oil. As Dr. Boatright explained

this morning we have here this yellow, that is the gas-cap. Here this that is the oil and the water to the left. Now water is heavier than oil. Therefore it is below the oil. Oil is heavier than gas so therefore it is below the gas but at the boundary line of these two there is a sort of mixture of the two. You may have a very wet gas well or a very gaseous oil well near the boundary line or again when we drill down at the West flank we will find wells where we have a mixture of oil and water. That of course, when we hit this we will not go further down, we will not go deeper. I use the word "top of thelime" and that means the incline.

Q How would you describe that map?

A This is a composite cross-section taken through the structure, just the same as the section here.

Q It is a composite cross-section of the geological structure in Turner Valley?

A Yes. You will find the cross-section from here to here is in the central part of the field because I wanted to show the highest part of the structure and from here on it is the South end of the field, so it is really a composite of those two sections shown here.

MR. NOLAN: And that will be Exhibit 6.

(COMPOSITE CROSS-SECTION HERE MARKED AS EXHIBIT 6).

WITNESS: Now we make maps of the field, what are termed structur-contour maps. All they amount to is that they are maps showing the elevation of a

given formation. Now we usually reduce them to sea-level for the simple reason as you see here, here is a well set up on top of a hill, that may be an elevation above sea-level of 4400 feet. This one here 4000 feet, I mean, the depth of this hill may be 7000 feet, this one 7400 feet. The only reason this one is deeper is because it was up on the top of the hill so we reduce all that to sea-level. In other words this well here hits the top of the lime 700 feet below sea-level. This is sea-level here. This one hit the top of the lime at 3600, and Okalta No. 6 hit it 5707 feet, below sea-level. In the central part of the field the limestone actually emerges above sea-level and as Dr. Boatright pointed out the highest elevation known there is approximately 575 feet above the sea-level. Now this is just a cross-section through here. Now a structure-contour map is nothing but a map showing a number of these cross-sections throughout the entire field and putting the line on these elevations as is shown here. Now this zero is sea-level itself. Sea-level itself is here, on this contour line, here is one at 500 feet above sea-level. Now the 1700 foot sea-level line, this is 1500 and that is 2000, we mark it at 500 foot intervals, so you interpolate between the two, so the 1700 foot line runs along here.

So I have shown here in green lines what is known as the gas-cap area and in red the possible crude

oil area, and down here at Okalta 6 we have water but I have not shown it on there because we do not know exactly how far it goes up the dip. That is what is known as astructure-contour map and I am submitting a smaller scale one showing exactly the same information, exactly the same as this map only on half the scale, and on which I again show the gas-cap, the proven oil field, the possible oil field and the water. That will be Exhibit...

THE CHAIRMAN: Exhibit 7.

(CONTOUR MAP HERE MARKED AS EXHIBIT 7.)

WITNESS: On this map are shown the eastern limit of the structure as defined by the major sole fault. Now this is where the top outcrops at the surface. This is where it is encountered in the limestone. Now that is shown here. Here is the surface,here is where it hits the limestone. Now this is on a scale larger than that, so the scale is greater on this than it is over here. Now I said on this map are shown the eastern limits of the structure as defined by the major sole fault. The boundary between the gas producing, gas-cap, area and the possible crude oil area, and also the possible western limit of the field as defined by the edge-water, which I have down on that map which is the exhibit. I have not put the water on here. Now the relationship between ,this map and that cross-section, that is clear now is it?

THE CHAIRMAN: Yes.

WITNESS: Now the producing horizon. As we

all know, the oil and gas found in Turner Valley does not exist as a pool, but exists within the openings or pore spaces of a solid rock, the producing horizon. There are two such producing horizons within the Paleozoic limestone known as the upper and lower zones. This is the upper and this is the lower. The thickness of these two zones varies considerably, but the average may be regarded as approximately 50 feet. Now Dr. Boatright gave you 170 feet, and I will explain a little bit later why I cannot quite agree with that interpretation. If the exact percentage of open pore spaces and the thickness of these formations throughout the field were known, it would be an easy matter to figure out the total amount of oil existing in these formations. However, not enough data areavailable to make this calculation, and besides it would be of only academic interest, of no value to bring the exact amount which could be produced or recovered. Now I am going to deal with the subject of porosity and permeability. This is like a crazy quilt for the moment, but I am going to try to explain to you the difference between porosity, andporosity which is permeability. On this end of the diagram you will see these white spaces are supposed to be pore spaces. I have a small sample from the Valley showing what the porous rock looks like. You see some of those open points in there, some are smaller than others, and in some do not exist at all. That is the East producing horizon, that is where the oil comes from, not from a pool.

THE CHAIRMAN: Are you putting this in?

MR. NOLAN: I think if it is to be looked at it should be marked as an exhibit.

(SAMPLES OF POROUS ROCK MARKED AS EXHIBIT 8.)

Q MR. NOLAN: Exhibit 8 is what?

A Is a core and cuttings of limestone from the producing formation. The small chips are the cuttings.

Q Yes?

A Now the movement of oil or gas from the Paleozoic limestone in Turner Valley is dependent upon the following factors:

(a) Porosity, that is pore space or open spaces.
(b) Permeability, which is continuity of pore spaces, which allows the oil, gas, or water to travel through the formation.
(c) Fracturing and fissures.

Now as you see here, if we had a very porous limestone where the pores are not connected with one another, say we have oil in all of these pores and a well were drilled down into that formation, the only production that well would have would be what it got out of the pores which are in contact with these holes. On the other hand if you had pores of this kind which are connected with one another you will see that a well drilled down here, would drain from away out here and also from over here, in fact much further than 40 acres possibly, and you can see also that if we had a porous area like this section, had a porous area like this, which has no permeability, then all that well can be expected to produce is what it is bounded by.

The non-permeable rock. That is also explained in a diagram in this report.

Q What are these fractures?

A In addition to that the limestone has been fractured or cracked, which makes the permeability even greater in local spots, but not throughout. We have examples of that as I will point out later. It is common knowledge that a very porous limestone formation may have limited permeability. The pores may be as big as this room but if they do not connect with the next room all the oil you would get is in this room. That happened down in the Kevin-Sunburst field, a well comes in big for a couple of days and then it lessens. In other words, the pore spaces may not be continuous or connect with one another over large areas. This factor can best be determined by behaviour of wells drilled close together and a study of the cores and rock cuttings from the drilled holes. If permeability were such as is commonly found in oil fields producing from a continuous sand body, inferences of adjoining wells and comparable production and pressures of simultaneously completed wells would be the result. This however does not appear to be the case as can be demonstrated by listing divergent results obtained at many wells drilled in close proximity to one another, in both the gas-cap and also the oil area of Turner Valley. For example from the gas-cap and another from the crude oil area is submitted herewith.

Sterling Pacific No. 1, that would be here.

MR. NOLAN: Before we leave this, might we have marked, please, the chart which shows porosity, permeability and fracturing as Exhibit No. 9.

Chart here marked
EXHIBIT 9.

WITNESS: I am now giving the example of these two wells and I will point them out, Sterling Pacific No. 1 and Mercury No. 3.

Q I wonder if you would point them out on the plan here.

A Yes, here they are, Sterling Pacific No. 1, Mercury No. 3, 400 feet apart. Sterling Pacific No. 1 and Mercury No. 3 are located 400 feet from one another. Both encountered the limestone at approximately the same level, that is within a few feet and as they were completed incidentally about the same time. Sterling Pacific No. 1 encountered naphtha production of about 45 barrels per day for the first six months, while Mercury No. 3 average 190 barrels per day for the first six months. Now that leads one to believe that we may have barriers of that kind between wells. These wells are on the gas-cap area.

Then Sterling Pacific No. 4 and West Flank No. 1, these two wells, are located 600 feet from one another. Both encountered the top of the limestone at eventually the same level, about 2450 feet below sea-level, both of them. Sterling Pacific No. 4 averaged about 1000 barrels per day the first month, while West Flank No. 1 averaged

188 barrels per day the first month. Now there is something there that shows they are not connected with the same pool, to the same, where conditions are the same.

Now about fracturing, the phenomenon of fradturing has played an important part in the gas-cap area as was demonstrated by the bringing in of many naphtha wells during the 1926-1931 period when large fragments of loose limestone were hurled out of the wells at the time of their blowing-in, fragments as large as that big core there were hurtled up right through, sometimes they went right through the pipe, burst the pipe as they came out.

In fact it is highly probable that near the crest of the structure where the greatest flexing or bending of the limestone took place, the upper and lower porous zones are connected with one another so that inter-communication between the two exist. I will explain that here. This gives an idea here where the limestone has been flexed and bent, and that gives you a tendency for cracks to form, as you try to bend that rock, and these cracks may have developed to such an extent that this lowest porous is connected with the upper porous. So that while when you only drill into the upper porous, actually there is inter-communication with the lower porous part. On the west flank where there is no evidence of such extreme bending we do not find the same conditions in one of the oil wells like they do here in the gas-cap area. However, this phenomenon of fracturing may also be very localized, as is attested by the divergent results obtained in some of the very closely spaced gas wells, where large producers lay very close to small wells completed almost simultaneously, as in the case of Sterling Pacific Number 1 and Mercury Number 3. On the west flank, in the oil zone, fracturing is also present, but to a much more limited extent because of the relatively flat dip of the limestone where a lesser amount of flexing took place. An examination of well cuttings and cores show that the relative porosity of the variously drilled wells have great variation. Comparative porosity determinations for three representative wells are submitted, attached to this report.

Q MR. NOLAN: If you will just describe them, what are they?

Dr. T. A. Link, Dir.Ex.

A This is the log of the limestone in West Turner Number 1 well.

MAP IN QUESTION NOW MARKED EXHIBIT "10".

A This is one of the consolidated Number 1 a similar limestone porosity log.

MAP IN QUESTION IS NOW MARKED EXHIBIT "11".

LOG OF THE PALEOZOIC IN RICHWELL NUMBER 1 IS NOW MARKED EXHIBIT "12".

From logs we have plotted the comparative porosity. Where you see it black, that is big porosity, and where it is blank there is no porosity. That shows the upper porous and the lower porous quite distinct . Here is one of Consolidated Number 1 where you note the porosity is not quite as big. It is almost comparable up here in the upper porous but not in the lower. Here is one of Richwell where the upper is very good and the lower is not so good. Incidentally on these same logs you will see the drilling speeds plotted, which are also indicative of porosity, but not always, as I will explain a little bit later. If you wish you can have logs like that on every hole drilled in the crude oil zone and the gas cap area, but these three will suffice to show the variations. It is, therefore, again concluded that the permeability is limited to such an extent that large scale and rapid migration of oil within the oil area and up the dip into the gas cap area is not to be expected, likewise since that fracturing is also a localized condition large scale migration via the fractures from the crude oil area into the gas cap is also highly localized. Now there is one other point I would like to bring out. I did not

cover that in this report. I think I can add it to this Exhibit "9". As I told you just a minute ago that the drilling speeds are indicative of entering the porous zone but not always, because close examination of these porous rocks under microscope show that secondary calcide, that is a mineral, has been deposited in these pores in many areas. You can see if secondary calcide were deposit here that would block off inter-communication between that and that. If we had some more here then between that and that. Now we have all degrees of this secondary calcide redispositioned in Turner Valley. We have some cases where it is slight. In other cases it is all calcide and no oil in the pores at all. In other places only just slightly and other places where it underlays the pore space something like that, this being calcide and thus descreasing the amount of pore space and permeability. While we are on that subject I might mention that acidizing of wells in some respects corrects this condition for us. The acid will attack this calcide first and give you better inter-communication. So that a well may drill into a very non-porous area but be lying very close to one that is porous and permeable and if acid can be forced through a crack into this other area there will be a big well where you would have had a very little one if you had not acidized. On the other hand if a well comes in big in one of these good areas and you acidize it, all you are doing is increasing the rate of production for the time being, and the ultimate recovery may not be enlarged very much on account of the acidizing, because there is a limit to how far the acid will go. I think that covers that subject of

permeability and porosity. I may summarise it by saying that there is no one living can tell how big a well is going to be before you drill it. But those of us who have to watch these samples as they come out, before they ever test a well, have a fairly good idea how big the well is going to be before they make the production test on the basis of these determinations. Now, the movement of oil, gas and west flank water. Some of this is merely a repetition of what Dr. Boatright told you already. For some time there has been the contention that a hydrostatic head (water-drive) exerted on the west flank of the Turner Valley structure would cause an up-dip migration of the crude oil into the gas cap area. Now the condition which would be needed to have a water-drive is - as I told you this green is supposed to be water in the same formation. If this formation would bend back up this way, and rise to a level, well say to the same level as the green elevation here, this water coming in there you can see that would have a very effective hydrostatic head here which would push the oil up to the top. But from what we know this fault here projected cuts off this limestone down here at a depth lower than you see it here, and consequently there is no water-drive. It was also expected that this hydrostatic head would tend to keep the pressures in the crude oil area from dropping excessively and irregularly. Results obtained at the Okalta Number Six location have demonstrated the existence of flank water, but the slow rise of the water into the hole indicates that the water is exerting very little, if any, pressure on the up-dip oil body. This conclusion is based upon the fact that the water entering the

well did not rise to a level high enough to indicate an effective water drive. The west flank water may, therefore, be regarded as dead water, acting merely as a barrier to down-dip migration. Because of its mobility, migration of the gas within the gas cap area must have taken place, and equalization of pressures within that area may take place over a reasonable time if all wells are closed in, but data obtained to date indicate that almost complete equalization would require at least ten years, if not more. There is no doubt that the lighter and more mobile gas from the crude oil area is, and has for some time, been passing up the dip into the gas cap area, leaving the oil which is less mobile and heavier, behind. In other words, the orange coloured oil is of a lighter constituent and it is the orange coloured oil there which is escaping up into the gas cap to a limited extent. But the heavier oils are not. They are staying behind. Since results obtained at the Okalta Six location indicate no water-drive, it is apparent that migration of the oil up-dip into the gas cap is not expected to take place regardless of permeability, and with a relatively low and irregular permeability of the producing formation, the up-dip migration is again reduced to a minimum - at least slowed up to such a extent that the project of re-pressuring the gas cap with the hope of forestalling the pressure decline in the oil area, is a highly uncertain affair which will probably prove to be uneconomical. Re-pressuring of the gas cap area would then serve merely the purpose of establishing a greater natural gas reserve and the incidental benefit of processing the gas through

absorption plants before pumpng it back into the formation. Therefore, if the sale of the gas compressed from the crude oil area back into the gas cap area, and the money made from this via the absorption plant would show a profit over the cost of installing and operating compressors and gathering lines, the project can be recommended. With respect to this project it is again in place to call attention to the lack of great permeability, and intake wells would have to be changed from time to time because one well is capable of taking back no more than it has yielded unless its radius of drainage overlaps that of other wells. In other words, if you have taken one hundred million cubic feet of gas out of a well, you cannot put more than one hundred million cubic feet of gas back into it. Another thing, if you want to put back this one hundred million cubic feet - which is a small figure - you have to push the pressure up to the pressure at which it left it, and thatcosts money. Now up-dip versus down-dip migration of the west flank crude oil gas cap boundary line. That is more or less in keeping with what I have just covered but put in different words and brings out another point. Under the assumption of effective permeability, and a hydrostatic head or water drive from the West flank, it was naturally assumed that a migration of tne west flank oil body up the dip into the gas cap area would take place. That was assumed. The rate at which such movement would take place would naturally depend upon the magnitude of the hydrostatic head and the amount of effective permeability. Such an up-dip movement has been the history of all oil fields where the two above mentioned conditions were obtained. Before the

completion of Turner Valley Royalties Number 1, which is erroneously regarded as the oil discovery well, crude oil was being produced from Model Number 1, Advance Number 5A and Miracle Number 2. At these locations the top of thelimestone was encountered at a depth of 1707 feet, 1779 feet and 1871 feet respectively, below sea level. It is, therefore, safe to assume that the crude oil gas cap boundary line lay approximately 1700 feet below sea level, before the equilibrium was changed. Dr. Boatright used 2000 feet below sea level, and I believe that these two wells forced us to use 1700 feet rather than 2000 feet. What that amounts to it would decrease the size of Dr. Boatright's gas cap and increase the size of his oil area. That is all. B. & B. Royalties was a large well, and it was nineteem hundred and some feet below sea level.

DR. BOATRIGHT: May I interject something there, Advance 5A, as I remember it, was 1783 feet to the top of the lime and was a gas well to start with.

A They have always had a thing what they called discoloured naphtha in those days, which was a bad name to use. It was really coloured naphtha, I believe it would be best to call it, and also an oil well. The same way with Miracle. They had a case where they wanted to establish that Model was an oil well. You remember that, Mr. Frawley, with the Gas Conservation Board at that time?

MR. FRAWLEY: That is the gas-oil ratio?

A Yes, they took the gas-oil ratio. The Gas Conservation Board has recently closed certain wells because of the high oil-gas ratio. But Model and Advance 5 would at the present time be called, under the present qualifications,

have been called oil wells even in their earlier history. We might say 1800 feet or 1900 feet. It is just a two hundred foot difference. It does not matter much here or there. I am not going to be insistent upon that point. After completion of Century Royalties Number 1, 1600 feet below sea level, this well produced naphtha, and later on changed over to crude oil, thus indicating a limited up-dip migration of the crude oil boundary. Several other wells such as British Dominion Number 4 and others near the boundary line of the crude oil and gas, changed temporarily over to crude oil production. In every case these border wells produced a high gravity of crude and this change took place before many of the wells being drilled on the west flank were brought into production. After a large number of west flank crude oil wells were completed, and had produced for some time, and after the pressure dropped in these changing wells had reached a certain point, the gas-oil ratio continued to increase to such an extent that at the present time many of these border wells are again classified as gas wells by the Conservation Board. The results obtained at Okalta Six are almost conclusive enough to arrive at the conclusion that a water-drive is not present in Turner Valley. The gas-oil ratios - that is the amount of oil produced per one thousand cubic feet of gas, of many of the wells, drilled near the original crude oil-gas cap boundary line (1700 feet below sea level) is now changing so rapidly that soon many of these wells will be classified by the Conservation Board as gas wells. It is quite obvious that with the withdrawal of gas from the crude oil zone to the west of this boundary line, the gas-

oil ratio will become higher, and when it has reached the figure set by the Conservation Board, theywill eventually all be classified as gas wells. Thus, the gas cap crude oil boundary line will migrate down the dip, rather than up the dip as was formerly believed to be the case. I will admit that is a hypothetical migration down the dip, because it is in the hands of the Conservation Board. In considering such wells as Model Number 1, Advance Number 5A and Miracle Number 2, where no adjacent or off-set crude oil wells are being drilled to the West, and where no gas is being pulled out of the crude oil zone to the West of these wells, it is obvious that such wells will continue as crude oil wells over a much longer period than those where the equilibrium is now being disturbed by wells drilled in the crude oil zone. However, due to the lack of effective permeability, these wells will also eventually develop a high gas-oil ratio so that theywill also have to be regarded as gas wells. Reference has already been made to the structure contour map, submitted as Figure 1. A structure contour map consists of lines connecting points of equal elevation. These lines are called contours or contour lines. The East side of this structure contour map is delineated by the sub-surface trace of the major sole fault. The contour interval, that is the difference in elevation between contour lines, on this map, is 500 feet, and a contour which lies 1700 feet below sea level, with respect to the top of the limestone, is regarded as the Western Limit of the Gas cap area, as already pointed out in the early chapters of this discussion. The size of the gas cap area measures 7441 acres. The Eastern

limit of the crude oil area is bounded by the Western limit of the gas cap area, along the 1700 foot contour. To date no definite data are available with respect to the actual Western limit of the crude oil area. At Okalta Number Six the top of thelimestone lies 5,507 feet below sea level, and water was discovered in that hole. At the present rating the Anglo-Canadian Number 1 location is structurally the lowest producing oil well at 3,656 feet below sea level. That is not counting the Home Millarville Number 1, because it is still on test and we cannot say what it is. The crude oil-water boundary must, therefore, lie somewhere between 3700 feet and 5700 feet below sea level, with respect to the top of the limestone. That is somewhere between Anglo-Canadian 1 and Okalta Number 6. For lack of a better figure to arrive at for the crude oil-water boundary line, the structure contour line lying approximately halfway between these two locations must, for the present, be assumed to be the Western limit of the possible crude oil area. In other words, I am going halfway down here. It might be down here and it might be up there. I do not know. So we take it halfway. Due to the fact that the exact position of the contours below the four thousand foot level are conjectural at the present time, the forty-five hundred foot contour below sea level with respect to the limestone is regarded as the possible Western edge of the crude oil zone or the Eastern edge of the water. On the basis of this assumption, the possible crude oil area of Turner Valley is measured at 17,187 acres. That is the area lying between the 1700 feet and 4500 feet contours. This area

is indicated in red, and red striped lines on the accompanying map. The yellow is the gas cap area. The striped red is the possible oil area, the full red is actually proven. We know there is oil there. We have this area in the South end. Advance 5A, I assume it drains forty acres. Model Number 1 and Royalite 29 and possibly Home-Millarville up here, Home-Millarville Number 2. Now that is acreage about which we can really talk. We know something about it. All this other striped red is a possible oil area. Any acreage outside this area is merely potential acreage and cannot be taken into consideration for estimating known reserves at this time. Production statistics are available for this proven oil area, and the results obtained are the only basis upon which the recoverable reserves can be estimated. As a first approximation for this estimate the following data are submitted. Now I will deal with that afterwards. But here is Dalhousie 8 drilled in this possible oil area, and it was a dry hole. Here is Brown 3 a dry hole. Mayland 3 a dry hole. Royalite 2 a dry hole. Four dry holes in this possible crude oil area already.

MR. NOLAN: They are indicated by a different colour I observe there?

A They are white, the areas covered by them. Just blank.

Q The areas surrounding the dry holes in the possible oil area are white?

A Yes. Now bottom hole pressure. That is the next subject. See Maps Figures 4 and 5, which will be Exhibits.

MR NOLAN: This, Mr. Commissioner, is

described as bottom hole pressure contour map of the south end of Turner Valley, as probably existed July 1936.

MAP IN QUESTION IS NOW MARKED EXHIBIT "13".

MR. NOLAN: As Exhibit "14", bottom hole pressure contour map of the South end of Turner Valley dated November 1938.

A Yes, that is when they were taken.

MAP IN QUESTION IS NOW MARKED EXHIBIT "14".

Although no bottom hole pressures were taken in the crude oil wells during the early stages of development, this valuable information is being obtained now, and in some cases enough data are available to arrive at a figure with respect to the amount of oil and natural gas obtained for each pound drop of the bottom hole pressure. Dr. Boatright already explained that method to you. This method of calculation of recoverable reserves seems to be the only one which can be applied at the present time. Two pressure contour maps for the South end of the field are submitted herewith. The first one indicates what, in the writer's opinion, was the condition of the bottom hole pressure during 1936 when the first large crude oil well, Turner Valley Royalties Number 1 was completed.

(Go to Page p183-).

At that time only closed in pressure had been taken for the wells on the gas-cap. In other words they closed up the well and put the pressure at the top of the well and in order to have the bottom hole pressure you would have to add to that the weight of the liquid which happened to be in the hole at the time. As most of them were gas wells at that time it would not be much more than about 200 pounds, would it.

DR. BOATRIGHT: About 250.

WITNESS: About 250 pounds more. These figures were increased slightly to correct them up to bottom hole pressures and the pressure contours were drawn accordingly.

Our next basis Turner Valley Royalties No. 1 came in with a bottom hole pressure of slightly more than 1500 pounds. Century Royalties No. 1 had at that time a closed-in pressure of 935 pounds, and since this well lies slightly more than a quarter of a mile northeast of Turner Valley Royalties No.1 the above assumption seems reasonable. In other words the Century Royalties No. 1 may have had a bottom hole pressure of 1185 pounds using your 250.

DR. BOATRIGHT: It would be less than that for that small pressure, I think about 200.

WITNESS: Yes, 200 was the one I figured closer. It is just an estimate though. The highest closed-in pressure on the gas-cap at that time was 1420 pounds at Union Drilling No. 1. That is the highest pressure in the whole field, closed-in pressure, 1420 pounds, and it was further away

from the adjoining well, the Turner Valley Royalties one was very central.

Q DR. BOATRIGHT: How about Merland No. 1?

A Merland No. 1 is away down at that time, this is 1936.

On Map Figure 5 are shown the pressure contour lines as of November, 1938. A comparison of this map with the 1936 data shows the rapid decline in pressures which has taken place in that area over a period of two years. Because, as I have already pointed out, the amount of recoverable oil is dependent upon the gas pressure energy available, unaided by a hydrostatic head, these data are of vital importance.

Now I am not going to deal with that phase of it because Mr. Davies is going to cover the pound pressure drop.

Now we have some production graphs and charts. In addition to the data on bottom-hole pressures there are submitted in this report a series of production charts or graphs which show in a conclusive manner the rapid decline in production of a group representative of crude oil wells, border wells and a gas-cap naphtha wells.

MR. NOLAN: Now just a moment, can these be marked as one exhibit?

A Sure, just put them in as one exhibit.

MR. NOLAN: Might I have marked, sir, as Exhibit 15, 12 graph charts of representative oil wells in the Turner Valley, is that right, Dr.

A Yes.

TWELVE GRAPH CHARTS
MARKED AS EXHIBIT 15.

WITNESS: Two of these charts are enlarged here so I can explain them to you, and when you study them afterwards you will understand what I am trying to explain at the present time.

Q MR. NOLAN: All right, better get this marked too, if you are going to refer to it, this is the production chart of the Sterling Pacific No. 3.

A Yes.

PRODUCTION CHART OF
STERLING PACIFIC NO. 3
MARKED AS EXHIBIT 16.

Q What is the other one?

A The other one is of Turner Valley Royalties No. 1.

PRODUCTION CHART OF
TURNER VALLEY ROYALTIES
NO. 1 MARKED AS EXHIBIT
17.

Q Exhibit 17 is the production chart or map of Turner Valley Toyalties No. 1?

A Yes.

Now the regular decline of these wells was halted by acidizing them from time to time and the effects of proration or restriction of flow is also noticeable on these charts. Now the red line indicates the production by month of the crude oil from Turner Valley Royalties No. 1, and the green line indicates the gas production simultaneously for Turner Valley Royalties No. 1. The scale for the oil is on this side. This is 10,000 barrels, 20,000, 30,000, 40,000 per month and the gas

50,000, no, 50,000,000 cubic feet, 100,000---

Q 50 thousand thousand cubic feet?

A Yes, 50,000,000. Now the first month when the well produced, your figure does not mean very much because it may have come in at the middle of the month or the last day of the month, so we have to start here on the second month.

MR. NOLAN: Can the commission see that?

THE CHAIRMAN; Yes.

WITNESS: In the first month, July 1936, this well produced 25,600 barrels of crude oil. The next month 25,000. The next month 24,000 and so you can see here it had a very definite decline, that is the way it is producing until this point here when in June of 1937 and July of the same year it was acidized twice and look what it did to production, it is away up here, so that that well produced more on that basis than in that month, than it ever did before. In fact it did the next three months, but notice how it dropped below the projected curve, and there they give it another shot of acid and up it went again but you will notice that the general decline curve goes on regardless of this acidization, acidizing, and just how much more you will get because of acidizing is not known today but you will see it is not commensurate with what you got at the time of the acidizing or what you thought you were going to get. It dropped below the production curve until then you notice proration came in, P-plus is increased allowable and P-

Minus is decreased and so on and you will see they have been juggling it around down here in the last year, one day they can produce so much and in a couple of weeks they had to cut it down again and so on but in spite of all this shot in the arm, if you want to call it that, and this proration it is going down and there is nothing in the world that is going to make it go up. Another thing I want to call your attention to is the amount of gas produced. When this well produced24,500 barrels of oil the first month, the first full month, it produced only 80,000,000 cubic feet of gas. Over here, we will take it down where it is today, we will take it at this figure here,here it produced a little over 9,000 barrels of oil and 10,000,000 cubic feet of gas. In other words the gas production has dropped lower than the oil produced. In other words the gas-oil ratio is going up on the well. Another thing you want to notice is that as the acidizing takes place you increase the gas a great deal more than the oil and that gas, as has been pointed out, is the energy which you want to use to take that oil out, so when you get down to this part of the curve all this gas which was wasted there has gone, to take out that which remains in the hole. Now by projecting these graphs,I see I have another one here, I will speak about Turner Valley Royalties. By projecting this graph it is possible to estimate the ultimate recovery of oil

from a well. The graphs,-I have only shown you two,- but the graphs all show quite clearly that in closely drilled areas, like the south end of Turner Valley at least two thirds of a well's Potential crude oil is recovered during the first two years of its life. As an example Turner Valley Royalties No. 1 produced during the first two years of its life, you see here, 465,000 barrels of oil. If it produces another third of that, the total will be approximately 620,000 barrels, and I don't think anybody has to be an expert to see how in the world that well is going to produce another one-third of what it has produced, taking into consideration the decline shown there. Now assuming that this well drains only 40 acres, the recovery per acre will be slightly above 15,000 barrels per acre, for that well. Due to the fact that this well was producing for a long period without interference from other wells, this recovery figure is an exceptionally good one, and must be regarded as one of the highest. Compared with this recovery is the record of B. & B. Royalties No. 1, which I do not have a big chart of this but it is in the others, it came in a larger well than Turner Valley Royalties No. 1, and has produced for 20 months, 4 months less than 2 years, some 290,000 barrels of oil, and as you remember Turner Valley Royalties was rated at about 800 barrels initial production and B. & B. was 2000 barrels initial production. From the pro-

duction graph it is clear that at the end of the two years the total production for B. & B. will not be more than 300,000 barrels, and that the well will probably never produce more than 350,000 barrels of oil. Take that graph and look at it and you can figure it out for yourself. During the first month of its life this well produced more than Turner Valley Royalties No. 1 during its first month, and still it has a lower yield. The wells just cited came in with large production and must be regarded as at or near the top of the ultimate yield. There are however others which will yield a great deal less than the two just cited. Unfortunately, some of the more recently completed poor wells have not produced over a long enough period to project their decline curve, but two fair examples are submitted in graphic form, namely Sterling No.3 and Westflank No. 1.

I can only show you one of them here but just to give you an idea how they balance up, you will remember Davies Petroleum No. 2 was an exceptionally large well. It is down here. A very large well and it is surrounded by six other wells that are all very very small ones.

Q MR. NOLAN: Find that well here.

A Yes, I can find it here, here is Davies No. 1, No. 2, Here is Model Spooner No. 1, classified as a gas well now, no good. Sunburst No. 1, a small well. Spyhill, small well. Model Spooner, Reward No. 2, fair. Monarch Royalties fair. Sarcee fair. Newfold

terrible and Sovereign terrible . Maybe this permeability has something to do with it, but if you are going to take figures like Davies 2 as averages then you will have to take these six which surround it and average them with it. Now let us talk about Sterling No. 3, I have a graph of it here. Sterling Pacific No. 3 has produced over a period of 21 months, that is a fairly long life, approximately 73,410 barrels of crude oil.

THE CHAIRMAN: Has that been marked?

WITNESS: Yes, that is Exhibit 16. This is Sterling Pacific No. 3 which has produced over a period of 21 months approximately 73,410 barrels. That is quite different from 460 of Turner Valley Royalties. By projecting the graph, this graph now, you will notice the graph does not seem to be quite as steep, that is because we are using a different scale. This well was so low in production we had to increase the scale. By projecting the graph it appears highly probable that the ultimate yield from this well will be less than 120,000 barrels, which amounts to 3,000 barrels per acre on the 40 acre basis. Since the gas-oil ratio on the well is very bad now, this figure is probably too high, in other words, the Conservation Board is going to tell us to stop producing that well, and that shows very nicely how the gas is increasing and the oil is decreasing here. The gas-oil ratio is bad.

Now Westflank No. 1 has produced over a period of 10 months 44,879 barrels of crude oil, and will probably never exceed more than 100,000 barrels of production on this same basis. Project the graph, this on a 40 acre basis will amount to 2500 barrels per acre recovery. By averaging the figures for Turner Valley Royalties No. 1, and B. & B. No.1 and Sterling Pacific No. 3, and Westflank No. 1, the per acre yield for the four wells amounts to 7300 barrels. That is all that is recovered. That is the way it is going to be. That is what it looks like it might be. Now I do not think anybody after looking at these figures is going to say that they are going to double that production when they are going down that fast. Now this seems to be a fair figure to assume as the average acre yield of crude oil in the most prolific and proven part of the Turner Valley structure, in other words in this dark red area that I have shown you, in this area are 3421 acres, at 7300 barrels per acre recovered, the definitely proven area in the south end should therefore yield 25,973,300 barrels of oil, beginning with the discovery of oil at Turner Valley Royalties No. 1. Approximately 8,000,000 barrels have been produced to date, that is just a rough figure, it is a little high, thus leaving a definite reserve of 17,973,300 barrels for this south end area. We know, I am sure we are going to get that much. We may get more but I am quite sure we will get that much.

Q MR. FRAWLEY: Give us that figure again, Dr.

A 25,973,000 and then you subtract what has been produced to date. Now we will talk about the central and North end area, where is that little map again. Now in figuring out this absolutely proven acreage I have taken in every producing well, and gone outside of it, a quarter of a mile from it and I have also included Royalty 39 which has just started drilling, Royalty 38, Harris No.1 Miracle No. 1, There is an area we definitely know is going to give us 27,000,000 barrels, of which we have already got some 8,000,000. Now we have none north of here in this possible area. To date the completion of wells in the Central and North end of the Turner Valley Structure in the crude oil area, I am talking about, has been rather disappointing. A total of eight holes have been drilled in the possible crude oil area, and of those eight, half of them are definitely non-producers. Dalhousie No. 8, Brown Oils No. 3, Lowery Petroleums No. 2 and Mayland No. 3. We just tested it recently, it is 700 and some feet below sea-level and we thought maybe we had not drilled down into the second pores there back in the old days, so I suggested we go down to the second pores to see if we could get oil there and we drilled it down there and there is nothing in it, it is dry, and in Lowery Petroleums No. 2 here it is 1800 feet below sea-level and it did go out through both pores and it had some gas in it but no oil. In all of these wells the top of

the limestone lay more than 1700 feet below sea-level, and no crude oil production has been obtained from them. The other four, Model No. 1, Royalite No. 29, Advance No. 5-A and posssibly Home-Millarville No. 2, are crude oil producers, but not of great size, with the exception possibly of Home-Millarville No. 2. Now of course you cannot go on what you read in the papers because if anyone would take the actual production of figures given in the paper when these wells first came in we would have an unlimited reserve there. We would not have to worry, but we will see it is a good well at that and included in this. Two of these wells, Model No. 1 and Advance 5-A, are old wells, eight to nine years old, but they are not large. They owe their long life to the luck of not having been off-set by other wells. Assuming that these wells will produce 7300 barrels per acre, the same as down in the prolific area, which is giving them a high figure, which they would not when off-set, and adding their drainage acreage to that of the south end, the total actual proven crude oil area is 3,623 acres. That is all the dark red that I have marked here. At 7,300 barrels per acre, the total known reserve is 3,623 x 7,300, making 26,447,900 barrels, or roughly 25,000,000 recoverable oil, less the 8,000,000 which has already been produced. Now that is, I will admit, not a scientific approach, as Dr. Beatright gave you, but I do not think after you look at

these graphs, all these graphs, and of course I only gave you 11, if you check them for all the wells you cannot help but decide that Turner Valley Royalties and Davies 2 and a couple of these others, they are exceptional wells, but averaging them all up, and what are they bringing, what have they done up to date, and what do they seem to have left in there regardless of how much was in there to start with, there may be 100,000 barrels per acre in there, but if they are only coming out with 7300, that is all we have to deal with. Now this potential oil field I know nothing about. If you would say "Well would you like to go in a venture to drill up this, it is supposed to be proven area" suppose let us take one right opposite Dalhousie 8 you would not put in money in that, would you? Just because it is possible, but if somebody asked you to put one in between these, then you are almost sure you are going to get production, so the minute you walk outside these red lines, these dark red lines, you are talking about something about which your guess is as good as mine.

SUMMARY AND CONCLUSIONS

1 The Turner Valley structure is an asymmetrical anticlinal faulted fold approximately 17 miles long, two miles wide, and is bounded on the East side by a major sole fault. 2. The Turner Valley Structure produces from a porous dolomitic horizon in the Paleozoic limestone.

3 The producing horizon is very variable with respect to porosity and permeability. At, or near, the crest it is fractured locally.

4 The western limit of the structure is defined by edge-water which does not appear to be under a hydrostatic head, so that a water drive is non-existent.

5 The bottom-hole pressure in the crude-oil area during the year 1936 was probably around 2500 pounds. Dr. Boatright suggested that, he assumed 2630, varying from 1600 pounds at the gas-cap crude-oil boundary to 3400 pounds on the extreme west flank.

6 The gas-cap area is situated along the crest of the structure down to 1700 feet below sea-level, with respect to the top of the Paleozoic limestone.

7. The crude-oil area lies betwenn the 1700 and possibly the 4500 foot contour lines below sea-level.

8. To date, 3,623 acres have definitely been proven, and the probable recovery will amount to 7,300 barrels per acre. In this proven area. This amounts to a total known reserve of 26,447,900 barrels, including what has already been produced.

9 In addition to the 3,623 acres mentioned above, there are at least 310 acres which are non-productive, as proven by drilling.

10 If the edge-water extends no higher than the 4500 foot contour below sea-level, there are 13,254 additional acres of what may prove to be oil-bearing acreage, but only the drilling of holes will answer

the question of productivity and the amount.

11 The per-acre yield of the possible oil area not explored to date is a matter of conjecture, and no one, regardless of how expert he may be,-is in a position to make a prediction. If the present percentage of dry-holes north of the present proven area continues or increases, the per acre yield of the possible oil area may be uneconomical. The reverse may also be true.

12 It is here recommended that another independent calculation of the known recoverable reserve be made by an engineer in which costs, etc., are fully dealt with.

I think that is about all.

(Go to page 197).

THE CHAIRMAN: You wish to file that?

MR. NOLAN: I thought, sir, that might be of assistance to the Commission if I filed the Report of the witness as a separate document. There being two Commissioners, we will file two copies if we may.

DR. LINK'S REPORT WAS THEN MARKED AS EXHIBIT "18".

MR. FRAILEY: With your permission, Sir, Dr. Boatright will question the witness?

Q DR. BOATRIGHT: Mr. Link, first of all may I express my appreciation for the kind remarks at the beginning of your testimony, and I assure you they were appreciated. The first thing that I would like to ask about is this, how, in your estimation, does your contour map and the one we submitted correlate out as far as acreage is concerned. In other words, I would like to treat upon a few points of similarity of the two maps, that is as far as areas are concerned?

A I believe that you took the area of total possible acreage down to the five thousand foot contour.

Q Possible, yes?

A Yes, possible. Probable to the four thousand.

Q That is correct?

A I took the water possible up to forty-five hundred. That took a strip off. But I increased the possible oil area by only going down seventeen hundred feet, whereas you went down to two thousand.

Q Yes?

A So the one almost offsets the other.

Q As I see it, correct me if this is wrong, our contour lines are almost identical?

A Just about the same.

Q What you call a possible and what I call a probable productive acreage, both amount to about fifteen thousand acres?

A Yes, taking mine down to forty-five hundred at seventy-one hundred acres. If it would only go to four thousand we would take your probable and we would be about fifteen thousand acres. There is twenty-three thousand some acres between these contour lines.

Q Putting it in other words, my possible acreage and your possible acreage is exactly the same, fifteen thousand acres?

A Exactly.

Q The difference lies in what I call probable and you call proved?

A Yes.

Q Your proved, as I understand it, is three thousand and some odd acres, that is surely productive, whereas my proven, what I consider proven is down to the four thousand feet contour line, and includes ten thousand acres?

A Yes, in other words you take this strip right up the Valley this way.

Q That is right. Now in your opening statement you said the thickness of your producing horizon is approximately fifty feet. I wonder if you would explain how you determine that thickness?

A That is not an exact figure. Here is what happens. We have examined, of course, all these samples from every well that comes in. What is regarded by some as porous is not in reality porous, because a great deal of that which has been regarded as porous is in the crystalline

3

limestone and has no odour or any oil in it. When these wells were drilled in one of my duties was to be there so that when we hit the black lime, the bottom part, we quit drilling right away so we do not waste any more money on drilling extra footage where we do not need to. When these samples come in we examine them, and a great deal of that that you put in your 178 feet never shows any smell of oil at all. But when you get down just above the black lime there is about fifteen or twenty feet which actually smells and reeks of oil. It appears to me that is the only real productive part in it. The upper part above that is mostlywhite crystallihe lime or other lime which has less porosity and then there is re-crystallization by the calcides.

Q In other words, the fifty feet thickness is fifty feet of oil saturation?

A Yes.

Q Rather than gas and oil saturation?

A Yes. That is the average for the two upper horizons.

Q Well to correlate our thicknesses in another way. You use a thickness of fifty feet. What would you say the average porosity of that fifty feet is?

A I would say that it varies from five to fifteen per-cent.

Q What would you say the average would be?

A Oh, eight. That is just an estimate. We never have run a real porosity determination, as to percentage.

Q In other words, this was done under a microscope and is purely an estimate?

A Yes. The way that is done, the little cuttings I showed you are put under a microscope and then the number of

holes in them is counted over a certain area. It is just a relative thing. If we had for example a pore that size, it would never show up in the cuttings, because it is just space, and we might have one hundred per cent porosity there, but that means nothing.

Q Let us put this thing in another way? Let us assume that the porosity is eight per cent in that fifty feet, and that fifty feet represents oil saturation. As a matter of fact you have four feet of oil saturation in the oil area of the particular wells you have looked at, which are primarily along the gas-oil contact line?

A Yes.

Q In other words, that would be the same as saying my figure of eight feet was correct, if I assume fifty per cent was gas saturated?

A Yes.

Q You remember, of course, in my testimony I did assume that forty-five per cent was occupied by gas? The thickness, as a matter of fact of course, depends upon the porosity does it not? In other words, if you were told or asked to analyze a sample, or at least all of the thicknesses which contained any porosity of any kind from all of the wells that were available, your figure would have been much different than fifty feet would it not?

A Yes.

Q Would you say a figure of one hundred and seventy feet would be out of line, considering all porosity from a trace up to 20%?

A Yes, I would say it was too high.

Q How much too high?

A Oh, I would - of course this is just horseback figures, as you might call them - but I would not put it over eighty feet.

Q When you judge these cores, don't you have a system whereby you take the cores in as they come in and assign a certain letter or figure to those representing a degree of porosity which you think that is in thickness?

A Yes.

Q Do you total those figures in any way.

A No, I do not. I have a report complete on it, a Company report, and if you wish you may examine it.

Q Well the question I would like to ask you is this, in that analysis how many wells were involved?

A All of them, gas-cap and oil.

Q How many would you say, one hundred?

A One hundred and twenty.

Q In those figures about what was the average thickness of porous section, what average of porosity?

A You mean percentage of porosity?

Q Yes? You did not weigh the average figure?

A No. It was all pencilled down by one man because if we had two men on it personal error comes in. This man says this has "A" porosity and another man says this has only "C" porosity. What that does is to bring out to zero a great portion of the porosity, and that, of course, changes your permeability. You might have one hundred per cent porosity over here, and none over here. Therefore, that does not do you any good for movement within the oil zone, and it showed opposite this area here the porosity is practially nothing The cuttings

of Dalhousie 8 there was nothing in it.

Q Don't you find that condition of zero for porosity effective even in your proven oil area?

A No.

Q What about Spy Hill, surrounded by productive oil wells?

A Spy Hill had a good porosity.

Q What about its productivity?

A Very small.

Q Yet it is surrounded by very good wells?

A No, it is not surrounded by them It has Davies 2.

Q Which is the best well in the field?

A One of the best. When I plotted these porosities in that particular area Davies 2 was completely surrounded by what we call low porosity, but it was in there and it drains forty acres of very very good area.

Q I am coming back to that well spacing a little later. I do not want to get off the subject of permeability and porosity. What, by the way, is permeability?

A I do not know.

Q As a matter of fact it is the ability to.....

A You mean the definition? It is defined in the report there. It is the ability of a liquid to flow through a medium.

Q And that ability in turn is the function of porosity, is it not?

A Yes.

Q But it is not entirely dependent upon porosity?

A No. A fracture may have something to do with it.

Q What else is involved besides porosity?

A There is one very important factor which neither one of

us covered and that is capillary attraction. That comes in there. It might retard your permeability, that is the ability to move through a medium, and that may be also a factor which caused some of these wells to decline so fast. And as you know as well as I do that most oil sands and porous limestone are wetted by water from the inside next to the formation. There is a volume of water around all these pores. If you remove that water the oil sticks to the formation much more than it would if the water were not there, and that decreases the permeability. Q.There is another very important criteria of permeability, and that is the physical characteristics of the fluid that is flowing throughthe formations is it not?

A Yes.

Q Jumping from that to another thing that might be of interest here, if we can maintain the pressures in the formation at approximately the point they are now, regardless of whether or not we can build up pressures, which would be virtually impossible unless we put more gas back in, it would have a very beneficial effect upon what permeability there is?

A Certainly.

Q And it is of decided advantage that there should be control of production and re-pressuring, etc.,?

A Yes.

Q And you allege the recoveries which have been in the past as high as eighty per cent.....

A There is one point on the fifty cent, which you mentioned this morning - if you do not mind I will cross-examine you - you suggested in some of this

evidence that there would be a recovery of only 20% and that even fifty per cent was recovered, didn't you make that statement?

Q No, the statement I made was this, that in fields which have this high pressure gas and where the high pressure gas is considered in determining the content of the sand, they found out what looked like a 25% recovery was actually a 50% recovery, due to this formation factor, so-called, which takes care of the gas that is contained in there. I think our principal difference between our estimates is in the fact you have taken the oil that came out of the ground without taking into consideration any of the gas that is in it?

A You mean natural gas in the gasoline?

Q Yes, natural gas. You have your wells in the first place pretty close to the oil-gas contact line, and they have rather high gas-oil ratios. As a matter of fact when you go down the structure we find the gas-oil ratios going down. We find the gas-oil ratios going as low as 965 feet per barrel?

A Yes.

Q In your analysis of this you entirely neglected that gas that was produced and which you notice was in some of these wells as high as thirty thousand feet per barrel, and that takes a certain amount of space, but its permeability enabled it to deliver a certain amount of gas with the oil?

A Yes.

Q And the fact that that gas was in there really had a detrimental effect upon that permeability, because of the high rates of flow going through that formation. Is

that not correct?

A It may be correct. Of course I used these examples because they were wellsover which we had a long enough period to arrive at a graph. Royalite 31 and Royalite 32 are small wells, but they have not produced enough for me to make any graph at all. In this report there are graphs of Sterling 4, 5 and 6; Davies 2; Royalite 30. Royalite 30 is the oldest oil producing well, and its production decline curve is very definitely shown similar to these others.

Q Pardon me, when you were speaking about Spy Hill, did I understand you to say the porosity was poor in that well?

A No, I thought it was good, at least when the core came from it.

Q It is good. I have some records?

A Yes.

Q Going on with this permeability idea. As I remember you had a chart?

A Yes.

Q It is an Exhibit there?

A It was made in a hurry, it is this one.

Q Yes. I just wanted to point out that is in one plane?

A Yes.

Q Permeability as a matter of fact has three planes. Just on the law of averages alone a large number of the pore spaces you show as being impermeable, as a matter of fact will be permeable?

A May be permeable this way.

Q In other words, inthe field as a whole, while one individual

well may not drain that whole area as a matter of fact if the field is developed & the whole area will be drained, is that not right?

A I would not say that exactly, because we have some wells where we have no porosity or permeability at all. In fact you could take that map and there might be an evident lack of premeability in the plane this way and that way, and not that way.

Q In other words, if that were the given permeability in one plane you would have at least three times the permeability the other way?

A Yes. If it is non-permeable it does not matter.

Q The reason I brought that out - I was sure you understood it - but I was afraid that it might leave an erroneous impression in the minds of the Commissioners. Now then, you brought two comparisons into play which were Sterling Pacific and Mercury Number 3 wells, I believe, and gave statistics on those wells. I wonder if you would mind pointing those wells out?

A Sterling Pacific. Mercury Number 1 and Mercury Number 3. They are gas cap wells.

Q You gave a comparison of forty-five barrels a day for Sterling Pacific 1, and one hundred and ninety barrels a day for Mercury Number 3?

A Yes.

Q Do you know what the separator pressures were on those wells, were they the same?

A I cannot answer that.

Q Are you familiar with retrograde condensation?

A Yes, you explained it this morning.

Q Are you familiar with the results that are obtained by varying pressures in separators?

A Yes.

Q In other words these two figures may or may not be comparable?

A I may tell you this that we .....

MR. FRAILEY: There are at least two other people - if this is important and you would like to discuss it - this matter of retrograde condensation?

A We own Sterling 3. Somebody owns Mercury Number 3. I think we have had better production practice in our Department than some of these Independents, and I think in that case you will find our back pressures were more like they should be than the other ones.

Q That was the very point I was trying to bring out was this, in comparing these wells, particularly in the gas cap, the production figures are largely the result of the way they are operated, and the way the wells are completed. Therefore, it is not right to pick out two wells. You could go all through the field and pick out wells and get very obvious discrepancies?

A Yes. I can go all through the field but I just picked on that one case, because I did not want to burden you with too many examples. We also acidized that Sterling 1 and it did not do any good.

Q That might have made the difference. You had the 190 barrels?

A No. We are the ones that had forty-five barrels. We were the small one there.

Q Is it not also true that the way wells are completed has something to do with their ability to produce, whether they are drilled in with mud, oil or water?

A In those days, they were both rotary wells and both completed with mud.

Q But just saying they were completed with mud does not tell the true story because the muds may have been of different weights?

A Yes.

Q And the penetration of the mud into the formation might have been different?

A Yes.

Q In other words, the point I zm making is this, in this thing we have to take the thing as an over-all picture and not as two individual wells?

A If I look at this map I could give you several more examples and very definite ones.

Q During your testimony, I may have misunderstood, but I understood you to say that migration did not occur, gas and oil, and then I believe later on you made a statement that it did occur, and quoted some example?

A Well you mean up the dip?

Q Yes?

A Yes I said it would be a limited migration up the dip, primarily of thelighter gas from the oil. Century Royalties apparently inidcates the migration of some of the lighter oil up the dip from the seventeen hundred foot contour - sixteen hundred.

Q As a matter of fact migration, whichever way it goes, is going to be in the direction of the least pressure?

A The least pressure, yes.

Q It is a matter of pressure control and not so much of the formation itself?

A Yes, if it is permeable.

Q There would be no migration at all if it was not?

A No, there would be none at all.

Q There was a statement made about acidizing. I think you said there was a limit. Is not that limit set by the amount of acid you use, and the pressure you use in putting it in the formation?

A You mean what good it will do?

Q Yes?

A Oh no. I think it is a matter of the way in which you put it in, and what the condition is which you are trying to rectify with the acid. I do not think if you will increase your acid it will make much difference. We found out that using up to fourteen thousand gallons of acid does not do any more good in some cases than three thousand.

Q There has not been a great deal of experimental work with that in this field?

A Oh yes. Acidizing started off with how many gallons at first, under certain pressures. We have varied them. We have put the acid in different places where we think there is better porosity, in the lower zone and the upper zone. There has been a great deal of experimenting done with it. It occurs to me that if a well is drilled into a good area, if you acidize it you are just accelerating production. If you drill it into a tight area you might - these fractures here are very often clogged up with calcide and you might shoot the acid through these fractures and clean them and so connect this tight area up with a good area and bring in a bigger well. That happened just recently.

(Go to Page 210.).

Q Well is there any reason why that same thing cannot happen in the event you use sufficient acid to get back into the pores of a big well, to open up another big area say?

A Well I think the acid will have spent itself before it gets very far, there is a limit to how far the acid can go. If the acid could be put in packages and sent away up there and opened when it got up there, all right, but it is spending itself when it is going out.

Q Now you made the statement, I believe, that the Okalta well proved no water-drive, I think we are in agreement on that so far as there being no water drive, but you made that statement and I didn't understand it at the time?

A The unfortunate part about Okalta Six as I say, it indicates that there is no effective water-drive except, perhaps, the expansion you mentioned this morning. If that well had stood for a week or two to allow the water to come in to see how high it rises, we would have had better data, but they did not do that. They started right in there and cemented the water off, but I think it was about four or five days after they put this cement in the hole, but the water which was coming in was not coming in very fast.

Q In other words, that was the understanding I had and I wanted to get it cleared up, I understood that something of that sort had happened, and that Okalta Six is not a criterion one way or the other?

A No, it was not given a fair chance to show.

Q Now, I believe in discussing the gas-oil ratio situation,

you made some such statement as this, that in the event re-pressuring was resorted to, so far as the oil horizon and the gas was concerned, that it would result in higher gas-oil ratios, as the field went along, would that not also be true if you did not re-pressure?

A Yes.

Q And would it not be worse if you did not re-pressure?

A Certainly.

Q Now coming to our acreage, I think I have already covered the facts that we agreed pretty well on our contours, but you have assigned seventeen hundred, which is more or less immaterial, to the gas acreage and to the oil, a possible acreage of seventeen thousand one hundred and eighty-seven acres, which is slightly more than I gave, it is slightly more than I gave?

A Yes.

Q Of course, you made the difference in the gas?

A Yes.

Q Now is it not true in making estimates of the type we are called upon to make here, that we have to use our best judgment as to what may possibly be the productive horizon? and the amount of production to be obtained?

A Well that is what everybody would like, that we should do, but from the records of the wells drilled, North of this area, and also from the records of the holes drilled in the gas cap area, you see I was here practicaly from the time, well there had been about five wells drilled in 1927 in the gas cap area and someone said that Royalite 4 was just a freak and there would not be any more like it, well that was proven to be wrong, but as we went down here we found bad parts, good

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parts, bad parts, and good parts.

Q Which again brings out the reasonableness of averaging the whole thing over as wide a range as possible?

A Yes.

Q Now is it not entirely probable that at least to the four thousand or possibly the forty-five hundred foot contour, is it not possible, do you know of any reason, definite reason, that is absolutely conclusive why that area will not be all productive?

A No, I have no reason, nor for why it should not be.

Q In other words this criteria which you use of these various wells, take for instance Brown Number 3, what is the history of that well?

A That well was drilled through the two porous zones very definitely, and today we received a sample, before they made the production test, and were told, I told everybody, I said "The well is not going to have anything in it at all", because all the pores were either filled up with either calcide or there was no porosity to start with, and they have acidized it and shot it and acidized it and they cannot get anything out of it. The same way with Dalhousie 8.

Q Was not Brown Number 3 completed, or rathr before it was completed was it not, didn't they have a string of tools in there, didn't they have a whirl of mud lost in that hole?

A I think you might be right in that, but it didn't alter the porosity a bit.

Q But it did alter the conditions under which the well would have to produce?

A Well I do not know, it might, sure, but Dalhousie 8, there was no trouble with that; this last one we tried

Mayland 3, there was nothing there.

Q In any of these wells did you have a crooked hole, do you know where the bottom of these holes are?

A The only way we can, we have a survey of Miracle 3, we surveyed that before we went back into it, to make sure there was nothing.

Q And where was it?

A It was 113 feet from the bottom of thehole, it spiralled down.

Q Which way, into the gas cap?

A Down in the gas cap about 113 feet West.

Q In other words when we take this criteria which are being used now to lower the estimate, as a matter of fact there was no great amount of information on these wells?

A I would not say that.

Q In other words it was not reliable information?

No, I would not admit that. I think the information was perfectly good in all four cases.

Q You say you do not know where the bottom of any except one of these wells were, and in that particular case you know it was in the gas cap, and you know in that particular area the gas cap was productive. Now why is that?

A I will give you Dalhousie 8, we did not have a directional survey. In general we have taken directional surveys of a lot of our holes, and it was my conclusion before we ever took them that when the rotary holes migrate they migrate up the dip and these surveys have proven it to be the case ninety-nine per cent. There were some where I knew they did not go exactly up the dip

because of the condition of the hole, and therefore, I did not expect it but Dalhousie 8 we had surveys and you will see Dalhousie 8 is marked here as 2400 feet below sea level.

Q Yes?

A And taking the surveys of that hole and assuming they all went up the dip, all of them, all the way up the dip, it is still 2200 feet below sea level, and it is still in the oil area.

Q And had poor porosity?

A Had no porosity.

Q Take anyone condition of these wells, you know the gas cap was productive in that general area and yet it did not produce there?

A Yes.

Q Therefore it must have been poorly completed or there was a local porous condition there?

A No, I would not go into that argument, if I did all the wells in the gas cap which were not productive were poorly completed, and all the crude oil wells are poorly completed, and I would not say that, when they are not producing.

Q I would not say that either, but I say because a well does not make a producer, does not necessarily condemn the area?

A No, you have to drill it to find out.

Q There has been no definite criteria which condemns that area?

A No, I am not condemning the area. If we did why we would give up all our leases.

Q Now Merland Number 3, what was the porous conditions in

that well?

A That one is the exception to the rule. It is very porous. That is the lower portion that we drilled was very good and it has nothing in it. We have acidized it and monkeyed around with it and that was drilled, the power portion was drilled ther and we found very good porosity, we drilled it with the recent drilling practi es and it has nothing in it.

Q And Spy Hill is anotherexample of that?

A Yes.

Q In other words, you have several examples where you have poor wells surrounded at least by good wells?

A Yes.

Q Therefore, these seven or eight cases which you have cited are not anything definite at all as to the porosity of that lower horizon?

A Well I will tell you, Dr. Boatright, here is the little Advance 5A well, here is the data, here are two bad ones, and there is a bad one, now I would be afraid to go into that area right now, to drill it.

Q Yes, but you would not go so far as to say that that area is not productive?

A No, I would not say that.

Q Now as far as the bottom hole pressures are concerned, how did you determine that bottom hole pressure map which I believe you have put in as an Exhibit?

A You mean the first one?

Q Yes, the 1936?

A The 1936 one I took, as I told you before, the closed in pressures of all the wells up here in the gas cap

area, you see?

Q Yes, how many wells were there?

A Oh there must have been seven or eight.

Q How were those closed in pressures determined?

A The Government took them, I cannot tell you exactly how they did it.

Q There was no measurement made of the fluid level of the well?

A No, no.

Q In other words just?

A Just straight.

Q In other words they may or may not be good?

A Well I think so far as closed in pressures are concerned the figure which you gave this morning at 2100 pounds original pressure of the gas cap area is the one which I have been using for ten years, and I have taken these closed in pressures and weighed them exactly as you did and my closed in pressure figure is exactly, well within a couple of pounds, of yours, and if you are going to use that as argument, we have to say they are good enough for this argument.

Q Then you did not take a definie figure?

A No, I just went and took a horseback figure of 200 pounds and added it to the closed in pressure and then started and spaced the pressures the way they are spaced today you see.

Q Well from that did you make any estimate of other reserve?

A No. No, I used to make estimates of the gas reserve every year for the Company on the gas cap, and I think yours is a little bit higher than mine, that is all, they are just about the same.

Q When you discussed the Turner Valley Royalties well where is that well?

A It is 2450 feet below sea level, it is well in the crude oil area.

Q And you used two or three others, I believe, that is the ones of which you have production?

A Yes, but there are, the B. & B. is 1900 feet below sea level here, I do not know, I did not show a chart of it, and Sterling Pacific 3 is 2100 feet below sea level, I may be wrong in that, it is right near the edge.

Q Well this, in arriving at that figure of 7000 barrels per acre, what wells did you use?

A I used, it was Sterling Pacific, Turner Valley Royalties 1, B.& B., West flank 1, and Sterling Pacific 3. Now the below sea level data for those is 2100, 2450, 2450 and about 1980.

Q And you took that and divided that by forty acres, didn't you?

A Yes.

Q You knew of course that B. & B. and the T. B.R. wells, there are two, four, six, seven wells in that a hundred and sixty acres, and the well spacing there is twenty acres to the well, and the Westflank 1 has two, four, six wells, immediately surrounding it, all of them on twenty acre spacing?

A Well the thing is this, a lot of these wells were drilled sometime after these wells came in. Now you took Westflank, the reason I took those two, they are right together, I can give this one a forty acres over there and then that one forty acres over there. As a matter of fact Sterling 4 is draining, we can give Sterling 4,

Q How do you assign acreage to a well?

A I take that.....

Q For production pruposes?

A I take Sterling 4, I just took forty acres because that is the spacing you are using now, xxxxx but we can take Westflank here and Sterling 4, give them forty acres each and divide those figures by eighty, put both together.

Q As a matter of fact the fallacy I want to point out in that argument is that the well spacing is not forty acres, it is probably twenty, which would probabky make your seven thousand figure check with my seventeen thousand fairly closely?

A Well the thing is this, Dr, Boatright, I think Sterling 4 drains more than forty acres, and Westflank, now if you would take Sterling 4, 5 and 6, and Westflank 1, 2 and 3, you can certain assign them forty acres per well.

Q Did you take those wells?

A No, I say I am sure if you take the figures you will get the same result.

Q Well did you not make this calculation, take these.....

A No, I just took those two here together and then B. & B. and Sterling 3. Now Sterling 3 is draining from the oil area a great deal more than forty acres.

Q How much oil is Sterling 4 producing?

A Sterling 4, where are the graphs?

Q Would 419,000 barrels be about right?

A Yes, that is about right.

Q Then on that basis that well would have produced about 620,000 barrels to the end of its lifetime, assuming your figure of two-thirds of production?

A Yes.

Q Is that about right?

A About right.

Q And if that well produced from a twenty acre patch, how much would that make per acre?

A Oh that would double it if you took twenty acres. If you took ten it would quadruple it, yes, Sterling 4 to date has 462,322 barrels.

Q Well then, if we assume that that well will produce 620, which would be about right?

A Well looking at the graph, I would say not now, after I look at this, it is producing now, if you want me to give you an idea, it is producing now per month a little over five thousand barrels.

Q About twenty-five barrels a day or a little better?

A Yes, that well came in, the first month before acidizing it it was producing 30,000.

Q While we are on that decline graph, what is the characteristic of the decline graph?

A It flattens.

Q In other words, when a well gets down to twenty-five barrels a day, that does not necessarily mean it is anything near the end of its life?

A No, but the gas-oil ratio can be so high that you will not be allowed to flow it.

Q But in that event the balance of the field would get the benefit of that extra oil would it not, but coming back to Sterling Number 4, the well has already produced 419,000 barrels?

A Yes.

Q And if that well spacing were twenty acres, that would be twenty for that one well, or at least it would be ten thousand barrels for one of the wells on which you based

your judgment, even if we admit that Sterling Pacific 4 now drains a forty acres, then you admit that well made ten thousand barrels per acre already?

A Yes.

Q And it still is doing twenty-five barrels per day?

A I think I figured Sterling 4 will have about the same, given the forty acres.

Q The T.B. one and the B. & B. one are certainly not draining forty acres?

A I would not say the T.B. B. now is not draining forty acres but it did drain more than forty acres, for one-half its life to date, it may have been draining eighty.

Q In that event then it was a rather poor well on which to base an estimate, because of the fact you have a lack of information?

A I take it because it was an old well.

Q Well, but if the fact remains that that well, if it did not produce and is not producing under these constant conditions, it does not become a very good criteria does it?

A It is the best we can take at the present time.

Q Well it is the best you can take?

A All right, let us take.....

Q Would it not be better to take a larger number of wells?

A Let us take Davies 2, one of the best wells on the field, and give it forty acres. You will admit it is right in the middle of the area?

Q All right?

A It produced the first month 49,000 barrels. It is producing now ten thousand ,and look at the decline on it. It is going to flatten out I will admit.

Q How much production has it made altogether?

Dr. T.A. Link.

A 360,000 barrels. After that well had produced for three months I was asked to estimate how much it would produce and I estimated that at that time one million, two hundred thousand barrels, but I certainly would not estimate it now on this record.

Q But nevertheless it has already produced ten thousand barrels per acre?

A Yes, sure, but how about the holes which compensate for it all around it, these six around it?

Q Did you average this thing?

A No, but I am sure you are right on the similar figure.

Q You made a statement during your discussion that a high initial shows the best wells, is that generally correct, am I correct in that?

A If I made that statement I did not intend to. I made that statement in regard to a comparison between B. & B. and Turner Valley Royalties. Turner Valley Royalties had a high, had eight hundred barrels per day when it came in, and B. & B. something around 1800 barrels, but in spite of the fact that B. & B. came in bigger its ultimate yield on this method is going to be less than Turner Valley Royalties.

Q Which almost precludes the possibilities of taking a few isolated cases in any evaluation process?

A No, I will not admit that. I feel confident, we have gamen in this thing twelve. I just covered those four, as I did not think you wanted to hear me talking about all these things. Take Davies 2 here, that would give you worse.

Q Let me ask this question, what wells were you using in arriving at the figure of 7000 barrels per acre which you used?

A B. & B.; Turhr Valley Royalties, Westflank Number 1 and Sterling 3.

Q And then out of practically how many wells are you producing at the present time?

A About 60 or 65.

Q In other words you used four wells out of 60?

A Yes.

Q Which would be about what per cent, a very minor percentage of them were used?

A Yes, but let us put in these other four dry wells.

Q You cannot do that without using them all, and what I am pointing out to you.....

A They would be zero.

Q Your criteria is based on four out of sixty some odd wells?

A Yes.

Q That is rather a small percentage is it not, and we see from an analysis of those various wells that they do vary, and here you are trying to arrive at an average of sixty wells on a basis of four wells? Not only that but they vary widely from all these factors, but yet you only used four wells in arriving at the basic figures, that is absolutely essential to the evaluation.

A Supposing we took only the highest producing well. Forget about all the small ones, would that be a correct figure?

Q Not necessarily because of one fundamental fallacy and that is it is, in all these figures which you have used, you have used wells that have in general a fairly high gas-oil ratio, or occur along the high gas-oil ratio

flank and you have entirely disregarded the difficulties by virtue of the gas coming out of that formation, in that area?

A Your figures may be right. In fact my own figures check yours very closely for that particular area in there that these wells represent. In other words, that area between the twenty-five hundred and thirty-five hundred foot contour, but as you go down the flank that is a different story and that is the reason for the figure of fifteen thousand, which is just multiplying yours by two, and as a matter of fact the gas is displacing more than an equivalent amount of oil. In fact the space is probably two or three times that much.

Q Supposing in the wells you have chosen.....

A As you remember I called this a first approximation, and if I had known I was going to be given all this time I would have taken as many more wells as I thought legitimate, but when you take Royalite 30, here is one of those wells down in the high pressure area where you wished I had made all these calculations, and we have five months to go on, you cannot make any estimates on that but you can show the decline in that well from where you are there. That well produced 28,000 barrels, three months ago, now producing 12,000. I will admit it is pro-rated.

Q Sure?

A But the pressure decline on that well is there. The scale is not given here unfortunately, but the pressure on that well is dropping fast.

Q Is that not on account of permeability and not necessarily porosity, is it not possible to have a low permeability

and a high porosity?

A Yes, if your permeability is bad your porosity will rapidly decline. I will tell you Dr. Boatright, we know today how much oil has been produced up to November 1st, in these areas?

Q Yes?

A And Mr. Davies, who is going to follow me, will average the same thing up, taking into account all wells.

Q Does he take into account gas?

A Yes.

Q I see?

A As I said I am not an engineer, I am just telling you from the geological standpoint what your limitations are in assuming that this is a continuing thing like a sand body, which it is not, and then I take four wells the records of which we have, and consider that.

Q You would not take the seven thousand figure as any more than a rough idea of what is in the reservoir?

A I would say that the 7300 barrel recovery is what I expect in this red area.

Q And it is based on four wells?

A No, I have figured it on other wells too, but I did not include it in this.

MR. FRAWLEY: Dr. Boatright says he has some further questions, and unless you intend to proceed beyond half past four I think perhaps this would be a good time to adjourn.

THE CHAIRMAN: No, I think we willnot. We will adjourn now.

MR. FRAWLEY: Before adjournment I will file Exhibit "2" as I promised.

THE CHAIRMAN: Yes.

(The Investigation was here adjourned to be resumed on December 13th).

The Province of Alberta

IN THE MATTER OF THE PUBLIC INQUIRIES ACT

—and—

IN THE MATTER OF a Commission, dated the 12th day of October, A.D. 1938, to inquire into matters connected with Petroleum and Petroleum Products

Commissioners:

The Honourable MR. JUSTICE McGILLIVRAY
(*Chairman*)

—and—

L. R. LIPSETT, ESQ.

Session:

CALGARY, Alberta 13th December, 1938

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VOLUME 3.

WITNESSES:

E X H I B I T S

December 13, 1938.
10:30 a.m. Session

DR. THEODORE AUGUST LINK,

having been recalled, examined by Dr. Boatright said:

Q Dr. Link, does your Company have any acreage along that area, in the area in which you call "the possible"?

A Yes, they have a total of, counting what we have in the proven area and in that possible area, 5200 acres.

Q You have 5200 acres?

A Yes.

Q About how long have you had that acreage?

A We acquired, I should say, over half of it when Turner Valley Royalties came in.

Q And you have acquired the rest of it since that time?

A No, we had some of that from away back and on which we paid rentals.

Q About what proportion would you say had been obtained within the last two years, or how many acres have been obtained since Turner Valley Royalties came in?

A I should say 90% of the new acreage was acquired.

Q And is that pretty well scattered along the whole western range?

A It is what we think might be the best acreage in this possible acreage, in other words, it is not down, away down on the flank.

Q Do you have a map showing your acreage and when it was acquired?

A I do not have it here but I can supply it.

Q I wonder would you be willing to do that?

A Mr. Burns, if you will ask someone bring that over.

DR. BOATRIGHT: I believe that will be all.

THE CHAIRMAN: Any other questions?

MR. FRAWLEY: I have some questions.

TO MR. FRAWLEY:

Q Dr. Link, you are the geologist in charge of the operations of the Imperial and the Royalite for Western Canada?

A Yes.

Q And Dr. Oliver Hopkins is the chief geologist for those two Companies?

A Yes.

Q And Mr. L. V. LeSueur is the Vice-President of the Company?

A Yes.

Q And a man who has devoted considerable time and thought to Turner Valley problems, has he not?

A Yes.

Q You are perhaps aware that Mr. LeSueur attended at a sittings of the Tariff Board last February when the question of the Turner Valley reserves were discussed and the movement of crude, the possibility of getting a movement of crude to Eastern Canada was brought before the Tariff Board?

A Yes.

Q I want to read to you what Mr. LeSueur said on that occasion, on the 2nd of February, 1938, on page 324 of the transcript.

"Mr. LeSueur: Mr. Chairman, I believe that any remarks I may make will possible prove rather prosaic compared to the interesting remarks of Dr. Hume, Mr. Spratt and Mr. Shaw yesterday." Dr. Hume you know to be the chief geologist for the Dominion Government as far as Turner Valley is concerned, perhaps you have a better name for him than that, what is he?

A Yes, he is in charge of the oil division for the geological survey.

Q of Canada?

A Yes.

Q And he is pretty thoroughly familiar with Turner Valley?

A Yes, he is very familiar with the surface as I was but I do not think that Dr. Hume has to date made any serious study of the actual porosity and permeability of the limestone.

Q No, "And Mr. Spratt and Mr. Shaw yesterday", Mr. Spratt being now a geologist to one of the operating companies in Turner Valley but in last February being in charge of the Provincial Department of Lands and Mines?

A Yes, I have a high regard for both those men.

Q And Mr. Shaw you know to be a petroleum engineer from some place in the United States, Texas or some such place?

A I do not know him.

Q "I feel and our technical men feel that Dr. Hume's stand and his remarks formed a very admirable and

accurate background for Mr. Spratt's remarks and we also feel that Mr. Spratt's statement, which was very carefully studied, was fairly conservative". Now you were aware at that time that Mr. Spratt as a geologist estimated the potential reserves of Turner Valley to be 500,000,000 barrels, and the recovery 125,000,000 barrels?

A Yes.

Q "Mr. Spratt has predicated his remarks on the statement that "a reliable estimate of the oil reserves of the Turner Valley field is impossible at this time." Of course we all agree with that. At the present time we cannot make any very accurate estimate of the ultimate recoverable reserve. Mr. Spratt also said there were about 2,000 acres of proven area, and that is more or less what our geologists agree upon too; they figure about that." Now, Dr. Link, that is the figure which you gave us, Mr. Spratt's 2,000 was your 3421?

A Yes, it has been increased since then?

Q What Mr. Spratt gave us, the 2000 then, is now, according to your figure 3421 acres?

A Yes.

Q "Mr. Spratt', repeating, 'Mr. Spratt has predicated his remarks on the statement that "a reliable estimate of the oil reserves of the Turner Valley field is impossible at this time." Of course we all agree with that. At the present time we cannot make any very accurate estimate of the ultimate recoverable reserve. Mr. Spratt also said there were about 2,000 acres of proven area, and that is more or less

what our geologists agree upon too; they figure about that. I don't think Mr. Spratt gave any estimate of the recoverable reserves for the proven area, but if I recollect aright Mr. Shaw said perhaps 23,000 barrels per acre. Our geologists figure more or less the same; they figure about 20,000 barrels to the acre as an estimate, and that would give proven reserves of possibly forty to forty-six or fifty million barrels for that area."

A Well if that was figured, it was figured in Toronto, it is not my figures.

Q That is what, these are what Mr. LeSueur says "our geologists figure" and your chief is Dr. Oliver Hopkins, he is the chief geologist for the Company?

A Yes.

Q And my recollection is that Dr. Hopkins was in the room in Ottawa when this evidence was being given, I do not know as it matters. "As to the indicated reserves I think Mr. Spratt put the total at 125,000,000 barrels." And that of course is the indicated recoverable reserves?

A Yes.

Q That is what he says?

A Yes.

Q "That may be quite accurate. Practically the only difference between Mr. Spratt and our geologists naturally depends upon how much of the west flank is productive, and the feeling of our geologists

is that Dalhousie 8 and Brown 3 more or less indicate that there are dry spots, and our experience in the gas zone has indicated barren spots. Now the number and the size nobody can tell until the drill proves them. But on the other hand there are no doubt extensions to the south and west at the south and we see no reason to quarrel with Mr. Spratt's indicated reserve." Now that appears to have been the considered attitude of the chief executives of your company with respect to Turner Valley reserves as late as last February?

A At that time.

Q Last February?

A As I told you yesterday I always figured that Davies 2 would produce 1, 200,000 barrels, the actual recovery of Davies 2. That was figured before these estimates were made and when we had not enough data to arrive at a more definite conclusion. Now the figures that I gave you yesterday were figured up to November 1st of this year.

Q Well then, I take it that without treading on this dangerous zone, is it getting worse instead of better?

A The rate of decline had lead me to believe, now I will tell you one thing, the company has asked me on several occasions to sit down and figure out the estimated reserves of Turner Valley the same way that Mr. Spratt did there, and I justhedged out of it every time, I would not do it. I did not even want to put it on paper in a private report, what I think is in the field, that is that 500,000,000

figure.

Q Yes.

A I have on several occasions figured on the basis of 15,000 barrels recovery when it looked that way and arrived at the conclusion that if all of the field were productive down to a certain level it would get up as high as 50,000,000 barrels, but that is on the basis where the performance looked as if it would be 15,000 barrels per acre recovery, but I do not think that that is the story today and it does not matter what they said in Toronto there, they probably will also change their minds now.

Q I admire you for your independence of thought, but this was a statement of your Vice-President of the Company and to all intents and purposes the chief executive officer of your company in so far as Turner Valley operations are concerned, that is true is it not?

A Yes, but I am not responsible for any statements they may make nor are they for what I make.

Q No, but that was the statement he gave to the Tariff Board at Ottawa and made at a time when that was the particular thing which they were interested in, namely the indicated recoverable reserve, so that they could consider the advisability or otherwise of taking, of moving crude from Turner Valley to the Sarnia Refinery.

A Well you will find the history of every oil field, they make estimates on the recoverable reserve yearly or even oftener than that, and the most dangerous thing that an engineer or a geologist can do

is to give a figure and stay with it no matter what happens. That is a sign of weakness.

Q Ordinarily the experience is, is it not, that these reserves are corrected upward, these estimates rather, that are made of potential reserves?

A No, I would not say that.

Q Now Dr. Link, I want to ask you about something else and I am finished. You know that after, the production of crude increased very considerably about a year ago?

A Yes.

Q About a year ago last September or October?

A Yes.

Q And the problem immediately arose as to getting that crude out of Alberta into the Saskatchewan refinery?

A Yes.

Q Your Companies refinery at Regina and the British American Refinery at Moose Jaw, and the fact is that a great deal of crude oil has gone down there in the meantime?

A Yes.

Q These figures indicate that there is an average of 5357 barrels per day going to the Regina refinery of your Company and about 2000 barrels per day going to the British American, and that kept up during the whole of the year 1938.

THE CHAIRMAN: Now does the witness agree with that?

Q MR. FRAWLEY: Do you agree?

A I do not know a thing about that.

Q Now Dr. Link, you do know that the companies, the

refineries, went to the railway companies for the purpose of obtaining lower rates?

A Yes.

Q A rate that would move the crude to Regina and Moose Jaw?

A Yes.

Q And you know a rate was given to the refineries in Moose Jaw, your company, and the British American, which enabled it to move the crude, you perhaps know that the rate to Regina was 53.2 cents per barrel and the rate to Moose Jaw 18½ cents a hundred weight or in barrels, well I do not know, 48 I think.

A Well I know nothing about that.

Q You know nothing about the actual rate agreed upon?

A No.

Q You do know that there was some objection on the part of some of the Saskatchewan refineries to the fact that that rate discriminated against them and they brought the matter to the attention of the railway commissioners?

A Yes.

Q Now I want to read you a paragraph, two paragraphs, from the report of the railway commissioners given at that time after that application alleging discriminations came before them, and I am reading from volume 27 of the report of the Board of Railway Commissioners at page 415:

"The railways stated that, before establishing these rates 'that is the rates that I have given you of 19¢ a hundred weight to Regina and 18½¢ to Moose Jaw,'

before establishing these rates on crude petroleum oil, they satisfied themselves that the construction of a pipe line was feasible and that its construction would be undertaken from Calgary to Moose Jaw and Regina unless they established rates comparable with what the pipe line cost of transportation would be. It is stated that, following many conferences between the representatives of the railways and the parties in interest, the rates now published on crude oil were agreed upon; that they are somewhat higher than the cost of transportation by pipe line would be, but accepted by the oil companies who are thereby relieved of the risk of investment in pipe line.

Mr. LeSueur, Vice-President of the Imperial Oil Limited, appeared at the hearing and stated that they are producers in the Turner Valley; that they have a pipe line from Turner Valley into Calgary; that, when the new and large increase in production recently developed and upon reports concerning this producing field from their geologists, they put experts at work upon the question of feasibility, cost of construction, and cost of transportation of crude oil by pipe line from Calgary to Regina, and, after consideration of all these data, they decided to build a pipe line, unless the railways established a rate commensurate with the pipe line rate. He further stated that they had considered the possibility of the

Turner Valley field playing out, as all oil fields do eventually, which is a hazard in connection with pipe line construction, but, in this case, on the strength of their geologists' report, they were prepared to take the risk." Now it does appear from that Mr. LeSueur and his company had at that time, one year ago, received reports from their geologists sufficiently favourable and promising to warrant the construction of a pipe line 475 miles.

A Well that is, I never knew that they made those statements.

Q You have nothing to do with those statements?

A No, nothing at all.

Q And if that was the considered opinion, as it undoubtedly was, at that time you were not---

A They may have taken data which I sent from here and interpreted them accordingly, you see.

Q Yes.

A Now the whole thing to remember again is that, estimating the rate of decline of these wells, still indicated that they were going to produce somewhere around 12 to 15,000 barrels an acre, but the present showing is decidedly against that figure as far as I see it.

Q I would suppose----

Q THE CHAIRMAN: What is that?

A As it today, as it appears to me.

Q THE CHAIRMAN: What is your estimate today?

A My estimate today is about 7300 barrels per acre over this 3600 and some acres, that we know, I

feel quite confident we would have that much oil for sure and what we are going to have in this area is any man's guess. That is my position. It always has been because whenever the company asked me to estimate how much lies in there I have hedged that. I am afraid to say and I still am today.

Q MR. FRAWLEY: In point of fact the area has increased since then?

A Oh yes, the area has increased but the rate of production has dropped faster than I thought it would.

Q You did send down some information to the company you say?

A Yes.

Q And was that the data on which they felt justified in making that statement I have just read?

A Well I do not know. They have other men there in Toronto who take the same data and work on it and sometimes they arrive at different conclusions and they do not inform me about it.

TO THE CHAIRMAN:

Q Dr. Link, it is the gas of course which is essential to the elevation of your oil?

A Yes.

Q With the increased number of holes going down, are you in danger of losing the necessary gas pressure to elevate the oil?

A You have the danger of dissipating that energy by letting it flow out or into the air, and Dr. Boatright, that is a point, while I am here, I will bring it out now, he objected to my figure because I was far up the dip where there is more gas in

proportion to oil than down the dip. Now if we produce this oil up here we are going to find more gas in this oil than we find in the oil down here. The oil is heavier in addition to that, you have a certain weight of oil up here and this oil down here is heavier than that and heavier until you get right next to the water you find the heaviest oil with the least amount of gas, so Dr. Boatright objected to me using this area. Now it may turn out, in fact it is already indicated, this Anglo-Canadian No. 1 well, they were trying, they didn't have enough gas to produce it with, they had to take intake gas sufficient to run the well and that particular company is asking for a different spacing because of all that, because all their acreage is West of that and they are afraid to go up there. If Dr. Boatright objects to metaking dips, that rate of gas and oil as a basis, it may be in here but certainly it is not going to be down here.

Q Now failing an adequate supply of gas?

A Then we either have to resort either to what they call gas-lift, putting the gas back into the formation or pumping or a vacuum created, a vacuum to suck it up.

Q Will any of those methods in your opinion be practical means of getting oil to the surface?

A Yes, I think that the installation of pumps, if you do not wait too long, will help you to get ultimately a greater yield per acre but if you postpone it too long you may find that there is not enough fluid

level in the hole to work on. It may all be gas. Now of course on the West flank, if there is practically a solid body of oil there and very little gas, you can see that we are going to have to resort to pumping it because we have assumed, both Dr. Boatright and I, that the only energy we have to get this oil out is the gas.

Q. That is why I was wondering if you had not enough gas what would happen?

A. We will have to pump it as there is no water drive to push it out. Now in a great number of these fields where they have water-drive what happens, the history of the field is, in fact in the old days in the States they used to blow all this gas out, all this was permeability you see, they let it go out in the air and pretty soon the wells turned into oil wells and they produced oil and they sold it and pretty soon they turned into water wells and it flooded with water and that finished the field. Now that is not going to happen according to Dr. Boatright and myself because there is no water. Everytime we have to go west we have to go deeper. We cannot wait up here and wait for it to come up.

(Page 239 follows)

Q THE CHAIRMAN: You believe it is commercially feasible to pump do you, if you should be driven to that?

A I cannot say, I cannot give a definite statement on it. I think our engineer out in the field thinks it will be commercially feasible and it will cause your recovery to be slower. Now next summer, there is a great possibility next summer when they need more oil if we turn all the wells that are in the field now open wide we could not supply it. We have a theoretical figure. Dr. Boatright stated sixty thousand barrels. But that is for a couple of hours, and then four days later that same field would not produce thirty. It just cannot be done. So the only way you can keep up with the present market is you have to drill more holes, and we hope that the area continues as it is to here . There is nobody going to walk out like we did here twice, out here into that new stuff. We are going to develop is gradually from this up here. We are going to be cautious that we do not go in there because we are afraid of the water. Another example of a big well with a small one. Vulcan Brown, about as badly a handled drilling job as there was in the field. They got down and had the biggest well in the field. So drilling methods do not have much to do with it. We just completed Royalite 34 the other day, an off-set to it, and we are not even getting four hundred barrels a day after we have acidized it twice. We are drilling another one to the West of 37, and what the result of that will be I do not know . We will have to wait and see. It might be at that particular

area there is a big radius of drainage for Vulcan-Brown, and that they have got it all before we get it down. Or the fact may be it is right, that is the formation is tight, not porous and permeable. We just hit the wrong spot that time. Right close to here is the old Miracle well, a really small well. Here is Mercury Royalties, another small one. That was the biggest surprise to the field, that well. Because we had this small well and that one and that one, and then it comes in the biggest well. Now we are drilling more or less to off-set and we are getting little ones again. About this average. Dr. Boatright objected to me selecting certain wells, but I have taken twelve wells. Here is Royalite 28, Sterling 3, - they are all together, Royal Crest, Sterling 5 -a big well, Sterling 6, Westflank 1 2 and 3, all small wells, and Granville, an average well. They are all together and they lie there. They are in this contour down to here. These wells have produced up to November 1st, two million and eighty-six thousand barrels of oil. Allotting forty acres per well, they have produced to date slightly more than four thousand three hundred barrels per acre, and those wells are the oldest wells in the field. Most of these have produced more than a year. Turner Valley Royalties two and a half years. and if we assume now that half of that production is out of there, your recovery would be eighty-six hundred barrels per acre. But that is, as Dr. Boatright said, I am selecting a certain group again. I might go into another area down here and get slightly different

figures. But here again these are the oldest wells that have been drilled and I think they are the best to go by.

Q COMMISSIONER LIPSETT: I think the figures you gave are thirty-six hundred acres that you considered as fully proved?

A Fully proved, yes.

Q Can you give us the comparable figure to that at the time that this pipeline was built, that is what acreage was fully proved?

A I think about two thousand. Oh, when the pipeline was built?

Q Yes, was originally built?

A When was that pipeline built?

MR FRAWLEY: 1926 I think.

MR.NOLAN: 1925.

A There was nothing proved then. That pipeline was built - that is no crude oil was proved at that time. It was built for the naphtha and gasoline. It is now being used for crude as well.

Q At the time it was built then it was a sort of business speculation, I take it?

A Yes. Q. /If we take the figures that you now consider as fully proved, the investment would develop from a business speculation into something in the nature of gilt-edged security, as far as these thirty-six hundred acres is concerned, would it? Or would there be other factors to be taken into consideration?

A When it comes to the topic about how and on what basis you build pipelines I know nothing about it. I think there is Mr. Hill here can probably answer these

questions, Sir. I really do not know on what basis they go and build pipelines; what they have to know; how soon they wish to get their money back. It is a speculation you know, just like every other part of the oil business. If you happen to build a pipeline for a field that produces a lot more than you have figured, you are bound to make a lot of money. If you happen to do like in Mexico where the field turned into water overnight, you have all your pipeline and all your tanks junked overnight.

Q You are putting it now on the basis of a proven figure, really on the basis of a serious investment which is fully covered?

A Fully covered and we can get it out.

Q As distinct from the original speculative element where there was no proven area at all?

A That pipeline was built when I was in South America and I did not know a thing about it.

Q Can you give us a speculative figure now at all?

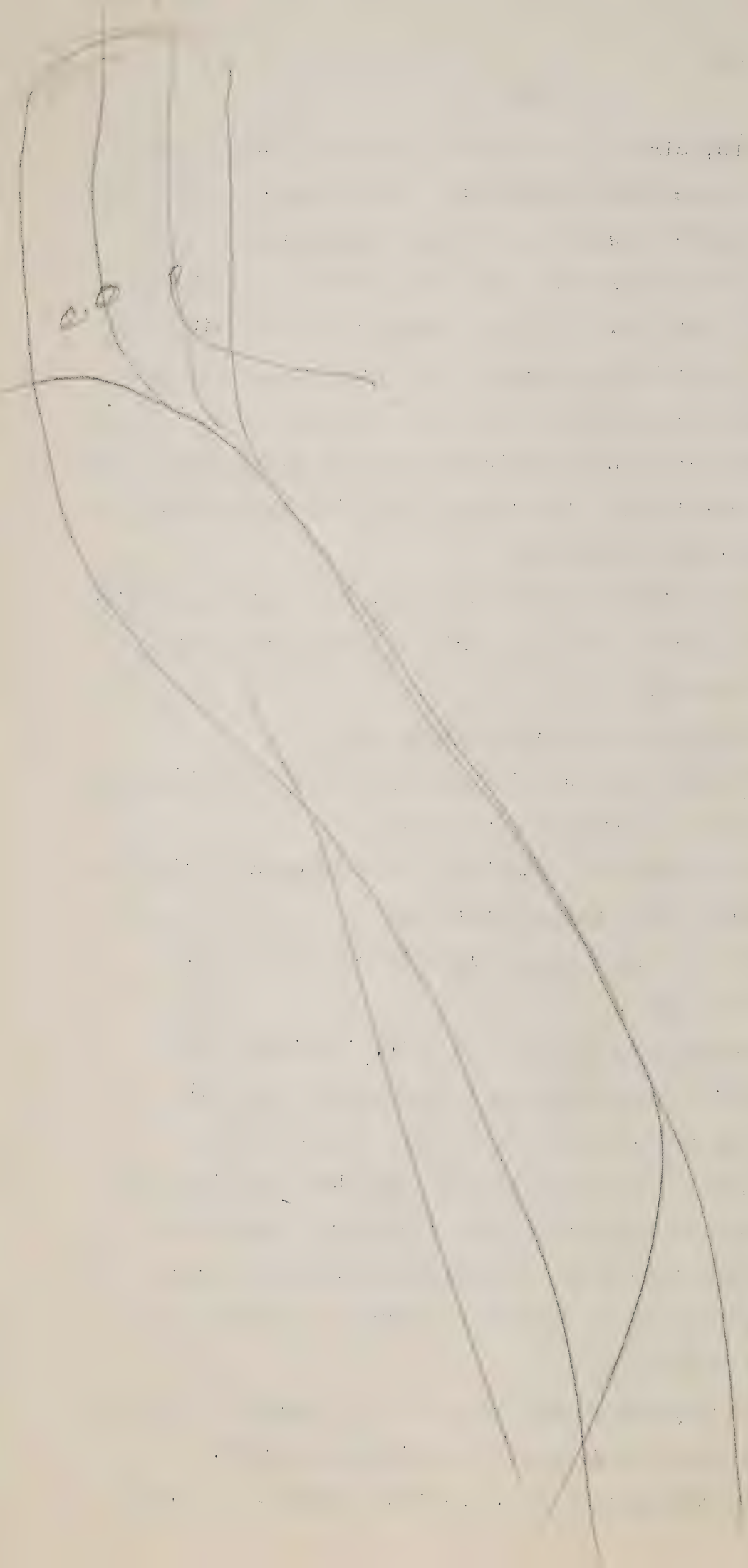
A As to how much.....

Q Dr. Boatright's figure, I take it, is similarly a speculation figure to what you were dealing with when the pipeline was originally built, is it?

A. Well, I would say if you take the remaining ten thousand or thirteen thousand acres of possible and apply the figure of six thousand barrels per acre to it, that is a speculative figure. I would not put it over that.

Q That is something like what was in the minds of these people when the pipeline was originally built?

A Yes, something like that. At the present rate with



eighteen millions, roughly eighteen millions left, and producing five millions a year, actually consuming it, there is only about three and a half years, but I hope it won't happen. But that is all we can say for sure. I do not see where anybody could go to a customer and say "I am going to supply you for five million barrels a year for twenty-five years or twenty years." I would not give that guarantee at all. Therefore, I cannot guarantee it, let us get our money back within a reasonable time for this pipeline. That is the way I would deal with it. I would want my pipeline paid for in ten years at least, and after that you can adjust your You can always adjust your rates every year the same as we change our oil reserves every year.

MR. FRAWLEY: May Dr. Boatright ask some questions?

Q DR. BOATRIGHT: Just as a sort of a re-hash of those twelve wells. You took in arriving at that figure of eight thousand that they were all in the gas cap area?

A Not in the gas cap.

Q That is in that high gas-oil ratio?

A Yes.

Q And they are also in a thickly drilled part of the field?

A It looks thick there, but when you look at the map right to the East of the Sterling wells there is no other well. You have all this acreage here. Here is a big space, and to the West of this there is nothing until you get to the next Legal Subdivision.

Q This big area up here is gas-cap is it not?

A Yes. But I will show you the contour line and it shows it more accurately. The seventeen hundred foot contour interval is here. Now to make a rough approximation there, there is six Legal Subdivisions and four wells on it.

Q But the majority of that acreage to the East is in the gas cap is it not?

A No, not of the acreage that I am allotting to these wells now.

Q How much acreage are you allotting to these wells?

A Up to the seventeen hundred foot contour.

Q How many acres?

A Two hundred and forty acres.

Q For four wells?

A That is sixty acres per well.

Q You knew, of course, the average spacing in that field was one well to thirty-six acres on the basis of their assigned acreage?

A Yes.

Q And if we used that figure, assigning it six wells, that would almost double your figure, making it sixteen thousand?

A I do not follow your argument there. These wells, it does not matter what you say you are going to give them, that is what they are draining.

Q Your estimate, I believe, was seventy-five hundred barrels per acre?

A Seventy-three hundred, I think.

Q If these wells are spaced to forty acres approximately, how much income would that represent? What is the price of oil on an average to-day? $ 1.20?

A $1.20 or $1.25.

Q What is your average royalty over-ride on these wells?

A The average is, I should say, twenty percent. But not ours. All companies.

Q Let us talk about yours?

A Our average would be, I guess, the average would be close to fifteen or eighteen per cent.

Q Then there would be fifteen or eighteen per cent of that oil immediately taken out, would there not?

A Yes.

Q How much would seventy-three hundred barrels per acre on forty acres amount to? Two hundred and ninety-two thousand?

A Let us call it three hundred thousand.

Q All right, let us call it three hundred thousand, and let us analyze that price of $1.20. Twenty per cent of that has gone right away?

A Yes.

Q What is twenty per cent of $1.20?

A Twenty-four cents.

Q That leaves only ninety-six cents?

A Or a dollar.

Q The drilling cost, I think we agreed here yesterday was $165,000.00 per well?

A Yes.

Q And so we have, if there is three hundred thousand barrels or three hundred thousand dollars then about fifty per cent of that goes immediately to the cost for drilling does it not?

A Yes.

Q So that brings our figures down then to what? Forty-six cents or forty-five cents?

A Yes.

Q In addition to that we are going to have lifting costs aren't we?

A Yes.

Q In order to recover that oil, and on the flowing life of the field that lifting cost will be what?

A I have heard figures as high as fifty cents a barrel and I have heard them claimed as low as five cents a barrel.

Q You misunderstood me. I said during the flowing life of the field?

A You mean operating costs?

Q Yes?

A For five years. I would say $50,000.00 a year. The $50,000.00 will pay for the operating equipment and operating costs.

Q You possibly do not understand. Would you say ten cents a barrel would be the total overhead, main office expenses and everything, would cover your production right now? In other words, how much is your lifting cost per barrel now? Or what is your cost per barrel for your operations in Turner Valley?

A I do not know that.

Q Ten cents a barrel would not be a bad figure?

A No, ten cents a barrel would not be a bad figure.

Q And during your pumping life it would be probably around maybe fifty cents a barrel?

A Yes.

Q We have how much left there? We had forty-six cents?

A Yes.

Q In other words, that brings our margin of profit down to about ten per cent on a highly hazardous adventure.

Would you drill a well for ten per cent profit? Would the Royalite Company drill a well for ten per cent if they thought that was all they could possibly get; taking into consideration the liability of dry holes and there have been eight of those out of sixty-two wells, or....

A No, the psychology of the oil business is this, every operator thinks he is the one who is going to get the big wells, and the other fellow is going to get the little ones.

Q After all, here we are interested primarily in a business proposition?

A Yes.

Q We are looking towards a pipeline and if the Royalite Company themselves thought that all they were going to get out of that field was seven thousand barrels an acre, would they drill any wells under the conditions as we have outlined them, would the Royalite ever drill another well if they thought they were only going to get seven thousand barrels?

A It is not a question of whether they want to, they are going to have to. They have contracts. They let contracts at the time they were getting what they thought was fifteen thousand barrels an acre and they have to drill that acreage whether they want to or not.

Q They could release the acreage could not they?

A Yes, they could release the acreage.

Q In other words, if they had to go into the highly hazardous business of drilling for seven thousand barrels per acre would they do it?

A No.

Q All right They are holding acreage aren't they?

A Certainly.

Q Thanks.

Q MR. FRAWLEY: Is that the Gas Company contract you mean?

A No, contracts with leaseholders.

Q You said they had a contract to drill and I was just wondering if you meant the Gas Company contract?

A They have obligations to drill wells with lease owners and they also have a contract to supply the gas.

Q You mean if they took a lease they committed themselves to do a certain amount of drilling?

A Yes, on a great number of them.

Q Your position is they would drill them although they did not get any more than just a small production?

A They would either drill them or give them up.

Q THE CHAIRMAN: How is the supply of gas to the City of Calgary affecting the reserve of gas for elevation purposes?

A I think that when we get through with this Investigation we will find that if we are careful we will have plenty of gas for Calgary for some time to come.

Q MR. FRAWLEY: What do you mean by that? Why did you relate it to the Investigation, Dr. Link?

A I thought that was the question. I think when we finish up here we will find out we have a gas field with oil as an incidental thing, relatively speaking, you know, when you consider the chances of the field and everything.

MR. FRAWLEY: I did not follow your reference to the Commission. Mr. Nolan desires me to call Mr. Davies.

.....

STANLEY JAMES DAVIES,

having been duly sworn, examined by Mr. Frawley, testified as follows:-

Q Mr. Davies, you live in Calgary?

A Yes sir.

Q Would you for the record state your qualifications please?

A In 1914 I worked as junior with the Geological Survey in Turner Valley while attending the University of Alberta, and completed my second year's work in the University of Alberta and then went overseas. At the close of the War in 1918 I got one of the War College Scholarships, and spent the scholarship at the Royal School of Mines and graduated from the Royal School of Mines in 1921, as Associate of the Royal School of Mines, London, England. Then I went with an English Oil Company who owned property in California, Mexico, Trinidad and Roumania. I visited the fields and operations in California for some time, and then spent six months as tool dresser in Mexico, and was transferred to Trinidad, first as a geologist and then on the production end of the work and spent two years in Trinidad. I was then transferred after a brief interval in Dallas, Texas, or around Dallas, Texas, to Roumania, where I spent a year, the year in Roumania being as Assistant Manager of their subsidiary and my particular work was in charge of the production and geological end. In 1924 I came back to Canada. Incidentally the reason for that was malaria and a health proposition, and I spent eight months at the Institute of Technology here and than became petroleum

engineer, in the Spring of 1925, with the Dominion Government and spent a year with the Dominion Government. Then in 1926, May 1926, I opened a consulting office here as consulting engineer in oil and natural gas work, and have been in that business ever since.

Q Would you just answer Mr. Nolan?

Q MR. NOLAN: Have you had any experience in the Turner Valley, Mr. Davies?

A Yes.

Q During the years you have been in private practice here?

A I have had a great deal to do with the geological, and particularly the production problems in Turner Valley.

Q Over a period of, you say, about twelve years?

A Yes sir.

Q Mr. Davies, you have prepared a report pertaining to the crude oil reserves in the Turner Valley?

A Yes sir.

Q Would you be good enough to state to the Commissioners the substance of that report in your own way? You have copies of it available, I understand?

A Yes sir.

Q And if the Commissioners would like a copy provided now that may be done for the purposes of following it?

THE CHAIRMAN: If they are available now you may as well file them now. You are having copies made of Dr. Link's report?

MR. NOLAN: Yes. They will be here in the course of the morning.

MR. Davies' REPORT IS NOW MARKED EXHIBIT "19".

Q MR. NOLAN: Go ahead, Mr. Davies, and just explain it?

A The first point I wish to discuss is that I was very much impressed by Dr. Boatright's evidence. I thought he had dealt in an extremely lucid and able manner with the general problem of the estimation of reserves in this area, Turner Valley. I was particularly impressed by the able way in which he presented his material. Before we are through, probably we won't agree, but that is an incidental factor.

THE CHAIRMAN: Not so incidental to the Commission?

A My Lord, I appreciate those remarks. I accept Dr. Link's long experience in Turner Valley, and the fact is that I know that he has available the most complete information on the limestone and the actual porous conditions in the limestone of any living individual in this territory, and I speak over some years of experience in saying that there is very little that Dr. Link does not know with regard to the actual underground conditions, structurally and with regard to the limestone itself. So that I accept in the beginning his figures as to the porosity and permeability and so on of the area that has been proven to date, and shall concern myself with the actual records of the performance in the wells that have been drilled in the crude area. In defining the crude area I accept Dr. Link's seventeen hundred foot contour below sea level, and I shall take the records up to the end of October, 1928. It has been clearly set forth, and I agree with both the

previous witnesses, that the only force that we have to bring oil into the hole is the expansion of the natural gas. In the report I have defined a number of things, different terms which the Commissioners may find unnecessary, but I did not know that the two previous witnesses would so clearly define all these terms. So it won't hurt to have the definitions before you. When we speak of bottom hole pressures we mean the force the natural gas exerts against the rock in which it is contained. It is not rock pressure. That is the rock is there but it is a solid piece of rock. We are not going into all the weight of the rock and all that particular thing and how it got there in the first place. What we are concerned with is how the natural gas is forced upwards in these small spaces in which it is contained, and we put a bomb down into these wells, and measure what that expansive force is at the bottom of the hole, and that is the more correct reading because the fluid level of these holes varies. Some of them have one hundred feet; some of them have two hundred feet and some of them haven't any. The fluid is the liquid lying in the bottom of the hole. So in measuring this force on the bottom of the hole we have prepared a picture of the pressure at the bottom of the hole or what we call bottom hole pressure. So I shall deal with bottom hole pressures, the most accurate and the latest information we have, and incidentally that takes in November's figures, and the actual record of each well from the date it came in until the 31st of

October, as to the actual production of both oil and natural gas; and then the pressures from the date of the completion of the well up until - well then the pressures again in November 1938. So my evidence is more in the first instance a matter of record of performance. We have a frog here which may jump one foot or four feet, as the previous testimony has brought out. From my point of view I shall endeavour to measure the first slight hop. If this Commission should meet at this time next year I could measure it a little more accurately, and a year following still more accurately. But I shall say this, that with due respect to the able manner of the previous witnesses, there is only one final way and one way only in which the oil reserves of this field of Turner Valley will be finally determined, and that is by the amount actually recovered from the wells drilled. That being the plain facts, what then is the record? In my report you will find a discussion of a great number of things that the two previous witnesses have already agreed on. So that I shall not repeat all that. I do not think it is necessary. The question then arises as to how this record has been compiled. Statement Number 1 is a record of all the wells in the crude area, which is all this area marked on Dr. Link's map, amounting to a total of 3933 acres, and I start alphabetically with the Advance well, and I show the record by months, beginning with Advance Number 1, of oil, crude oil and natural gas. The natural

gas is in thousands of cubic feet. It is shown on the first page, of Statement 1, and perhaps I might mention that all gas measurements are taken at our standard methods of measurement which are 60° Farenheit, and 760 millimetres of pressure. That is practically the same as Dr Boatright except I think he took 40°. Ours, we corrected to 60°. It does not make very much difference, but I just outlined the exact measurement base so that we are all agreed on it, as our figures may be slightly more than his. In the barrels crude are shown the G.P.M's. The term used, G.P.M., is the gallons per thousand feet of content of natural gas, that is the gasoline vapours that are carried with the natural gas, and they are measured by the charcoal test and this term G.P.M., it means so many .26 in the gas. This result is .26 gallons per thousand feet or 260 gallons per million cubic feet. The same thing multiplied by a thousand. But that is expressed by G.P.M's., in decimals of a gallon. I have measured where it has been recovered, barrels of natural gasoline that have been recovered by the absorption plant, and then after checking it will laboriously treat the whole of the record. Incidentally, they are in here alphabetically. I shall have occasion to refer back to that from time to time. You will note, my Lord, and Mr.Commissioner, the York lease. These pages should have been numbered, I can see that now. I have corrected in pencil a number of the points. First of all the two dates were given as November and December, and they should have been September and October.

WITNESS: And I have corredted them in pencil.

Q THE CHAIRMAN: Where are you reading from now?

A It would have been of great assistance if we had numbered the pages. These statements are in alphabetical order, all these reports and statements are in alphabetical order and at the end of statement 1 you come to York Oils, right at the end, my lord.

Q At the end of the book?

A No, at the end of statement 1. Perhaps I can find it.

Q Thanks.

A When we have time , my lord, we will mark these pages.

MR. NOLAN: I think at the adjournment, Mr. Commissioner, we will have each of your books numbered, and my friend's too.

THE CHAIRMAN: All right.

WITNESS: It should be September and October, that is not as shown here, I have changed it in pencil. Moving on further you will find statement No. 5, I have added some pencil, October gas-oil ratio is on statement 5 and there is added in pencil for a group of wells, 22 wells. While it is in pencil we will in due course change it to ink and make it permanent, and on the very last page of the report, the very last page, I have a note in pencil which we will make permanent "Recovery at 50 barrels per million cubic feet, 36.1%". It refers to some evidence that Dr. Boatright gave yesterday when he mentioned that the total recovery in the gas-capp area he estimated it at 20%. I happen to have in here for another purpose

a complete record of one of these gas-cap wells from the date that it was completed right up until the present time, and the evidence on his basis of figuring, I thought it would be of interest to put in that, the actual recovery was 36%. Now, my lord, and Mr. Commissioner, when I have completed the examination of all the crude produced by each well, the natural gas produced by each well, the natural gasoline produced by each well, we have facts which are our starting point.

The next phase of this report is statement No. 2, which is the statement of the bottom hole pressures from all wells from as early as wehave them up to and including November, 1938. Now, this is the most important phase of evidence. It is an actual measurement upon which we base the decline that has taken place.

Q THE CHAIRMAN: Excuse me, Mr. Davies, Mr. Nolan, Mr. Frawley has one of these statements?

MR. NOLAN: Oh, yes, my lord.

MR. FRAWLEY: Yes, I have.

THE CHAIRMAN: All right.

A I want to point out on this statement you will find marked off in brackets behind a great number of these measurements, a figure, for example, the first figure in November, 1937, 1700, and in brackets the number "25". It means that they shut in this well for 25 hours.

Q MAJOR LIPSETT: Where is that 1700?

A That is on the first column, in November, 1937, did I say 1700, 1770, 1770 pounds, and 25 was marked after it in

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brackets, so you will find all throughout these bottom hole pressure statements.

Q MR. NOLAN: What are the "d's" Mr. Davies?

A They represent days, they are shut in for three and a half days.

Q In that month?

A In that time in taking that measurement. In other words, there will be a great deal of these facts here which will indicate that if you draw on a well, take production from a well, that is too rapidly, the pressure at the bottom of the hole drops, and in the area surrounding it it rises from that pressure, whatever it is at the bottom, to whatever the bottom hole pressure will be back in the formation, so if we take the measurements and only shut this well in for 24 hours we get a certain measurement. Now, if we shut it in for 36 hours the measurement will be a little higher because it has had time for equalization. That goes back to Dr. Link's evidence as to this porosity and permeability factor, as to the rate at which it travels through the formation in the bottom of the well. Now, if we shut it in for three and a half days why we get still higher and in some instances where you see it has been shut in for 17 days the reading is still higher, so that to be absolutely consistent in our use of the evidence we will have to take them all on the 24 hour basis, or take them on the daily basis as the case may be. A great many people object to shutting in their well for 21 days, they lose that production during that time,

my lord, naturally . We then have to take a practical method. We take it on a 24 hour basis so that it is a relative figure. Generally speaking, the pressure will be higher than we see on the 24 hour basis. Well, this is the very best evidence we have. It is the most complete evidence we have. However, if we take it in one month on 24 hours and the following month on 24 hours and the following month on 24 hours they will all be consistently low, and we can then get the ratio of decline consistent, and a proper rate of decline. True, it may have been 50 pounds higher but nevertheless it would all have been 50 pounds higher, so we have taken care to be careful as to what figure we use.

Now, here I wish to point out that during the months of August and September, as you know, we have a Conservation Board, and they rule as to the amount to be withdrawn from the field. The rate of that withdrawal in September reached some twenty-eight thousand three hundred barrels. That was the allotted rate. A lot of wells did not and could not produce that amount but that was the amount allotted. That rate of withdrawal resulted in a rapid decline in bottom hole pressure. Now, I think the date was the 24th of September the withdrawal amount was reduced to twenty-two thousand barrels a day. That rate was still too high and the pressures were declining rapidly. Now, in October the rate of withdrawal was reduced to 11,500 barrels a day, which checks immediately the decline in pressure, and so we find that in the month of November and in some cases late in October, incidentally, these

bottom-hole pressures are nearly always taken towards the end of the month, th bottom-hole pressures as recorded on statement 2 show an increase. Now, the actual increase depends upon whether the well was drained too fast in the previous months and has now reached the same equilibrium. However, we take it into account and in order to be perfectly fair we have taken last month's figures, that is the end of November, although our production figures go only to the end of October. We wanted to get as near accurately as we could possibly come and we took the last figures we could get. Now, after a period of time, well, the equilibrium in the well has flattened off and these pressures apparently rose, which they, as an actual fact, did rise, but underground, nevertheless, still the decline takes place. The equilibrium flattened off and then we start. Now, we are concerned with the over-all decline, not any one month, up or down. We are concerned with the over-all decline. So much for statement No. 2.

With statement No. 3 we have taken two groups of wells. Statement No. 3 is just right next to statement No. 2, it just follows statement No. 2, my lord.

Now, in Turner Valley, before I discuss those two groups of wells, there has been a very slight leakage from the west to the east. It takes a very long time for it to be effective. This structure has been there for some millions of years and it reached an equilibrium long before we were concerned with it. Now, when we developed the area

we found that pressures in the area adjacent to the gas area, when actually drilled, that it is lower than the figure which you might calculate should be there. Well, it will be very substantial, instead of being 2500 pounds, it may measure out 2300 pounds. Instead of being 2,000 pounds it will measure out 1900, so we have this area, and I have divided it - to form an estimate of what is left in the ground from what has been produced in these particular areas, part of Dr. Link's proven area, - into one of low pressures containing some 36 wells and 1670 acres.

Q MR. NOLAN: It is on the map?

A Yes, I want to be sure that is correct, it is, and in area b, which had a high pressure, and which contain wells that have actually been drilled, a total of 1085 acres, on which 22 wells have been drilled. Now, that area I have taken all the oil that has been produced from the beginning of the well up until the 31st of Octoberr. Now, that is atatement No. 4. Probably the most important statement we have.

In statement No. 4 we list all the crude oil production to the 31st of October, all the natural gas production, and that is nearly all metered gas, so there is not much of a guess to it.

Q THE CHAIRMAN: You have been referring to the map which you put up there, is that the map which is enclosed in your submission?

A Yes, my lord. You each have a copy in the back of the submission.

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THE CHAIRMAN:

You want this treated as part of Exhibit "19", Mr. Nolan?

MR. NOLAN: Yes, my lord, it forms part of it, being the map attached thereto, there is one in each copy

THE CHAIRMAN: All right.

WITNESS: The average gas-oil ratio, that is the average amount of gas in each well is taken to produce this oil. The bottom-hole pressure at the date of completion of each well, and the bottom-hole pressure in November; the pressure-drop, whatever that pressure-drop might be, and then the factor, and that factor is merely based on Boyle's law, that, I think a previous witness described it, if you double the pressure you will have half the volume, three times the pressure, and you will have one-third of the volume. Mind, you know these well-pressures, there is a variable factor there, but for this purpose that is all right. As to the amount of natural gas which will be left in the ground we use this factor, based on Boyle's law, and we have the volume of natural gas left in area a. Now, that is obviously an estimated volume. It is based upon the amount of actual production of natural gas and the number of pounds pressure that dropped in the production of this gas.

I turn again to the point we have all agreed , that the force which brings oil into the hole is the expansion of the natural gas, is the natural gas, so that we are producing natural gas and carrying with it crude oil. That is primarily the process that is going on under ground in each well. Now, I take the

October gas-oil ratio, that is the last gas-oil ratio we have available. Dr. Link showed you some graphs, in which he showed that the oil was declining. In fact, the record here shows the same thing. It is in here in the actual figures on which Dr. Link bases his graph, showing where the oil declines and the gas production does not decline at such a rapid rate, so that the number of cubic feet per barrel of oil is gradually increasing in each well in the field. That has been characteristic of every well in the crude area.

Now, I specifically point out Advance No. 5a and Model No.1, which did the opposite in the earlier years of their life-time. When they were changing from naphtha production to crude oil production, but in these particular two areas that I shall deal with in detail, every well shows over its life-time an increase in the amount of cubic feet of gas to lift a barrel of oil. Now, temporarily, for one month, you can have the process reversed, but in every case you will find it is related to a high measurement of bottom-hole pressure. I described some moments ago where if you draw off a well at too high a rate the bottom-hole pressure will go down, your measurements will be away down. Perhaps I should give you some examples ofthat, to show you what a terrific factor it is. Prairie is a very good example. I am reading from statement No. 2. Prairie Royalty in August has a bottom-hole pressure of 1445 pounds. With that will be related the amount of cubic feetto produce a barrel of oil..

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Q MAJOR LIPSETT: Which one are you at?

A Statement No. 2.

Q Which well?

A Prairie, it is alphabetically.

Q I have it.

A 1445 pounds. In October 1545. In November 1690, and after the 1690, in brackets the number "30", it was closed off 30 hours. Now, you would think that well was goihg up in pressure. The more oil they took out the higher in pressure and the explanation is that it was drawn on very heavily in previous months, and the flow was restricted in October and November, and the pressure in the formation, around the bottom of the hole, equalized, and you got a raise in pressure. Now, along with that this factor occurred, that in the months of October and November it will produce barrels of oil with less cubic feet of gas, so we find that throughout the history of crude oil areas in Turner Valley, the number of cubic feet to produce a barrel of oil is related to the bottom-hole pressure in each separate well. I am not taking it over a great area, but each well still shows the same factor, and as the pressure declines the number of cubic feet to lift a barrel of oil increases. Now, that we shall discuss before we are through, the rate of increase, but at the moment the record is here. There is the odd case, as I pointed out, with Prairie, which apparently has reversed, but over the whole history of the period and of the production of all the we ls that is true.

If there is any particular well that comes up I will be glad to go into the thing. There is always an explanation for it, if you know what the explanation is, or the circumstances, rather.

Now, from statement No. 4 I gave the average amount of gas to produce a barrel of oil shown opposite each well, and then I gave the amount of gas in October, so you will find that the figure, the average gas-oil ratio, was, we will say in the case of Turner Valley Royalties, and I am reading now from statement No. 4, we find that 490,095 barrels was produced, with 2,160,711 cubic feet. That will be 2,160,711,000 cubic feet, or an average of 4400 cubic feet per barrel of oil, and in the month of August, I think is the figure I used on that one, it took 9800. The reason I did not take October's was that that well was shut in part time, and it does not give the proper information on it at all, but I will take a well that was producing consistently, steadily, every day. For example, Brown Oil No. 2, it produced 159,482 barrels, with 336,283,000 cubic feet of gas or an average of 1 barrel for every 2100 cubic feet, and in the month of October it took 2900 cubic feet, or we will take the case of West Flank No. 2. It produced 82,193 barrels of oil with 356,066,000, or for 1 barrel of oil a little over 4300 cubic feet, and in the month of October it took 1 barrel of oil for 7600 cubic feet. Now.....

Q MAJOR LIPSETT: What is the comparison, February, 1933, in comparison with October?

A No, it is over the whole life-time of the well, Major Lipsett, the whole life-time of the well. You see, they started rather low. I have the figures. The figures you can get from the production records, because each month the production record is given, and all you need to do is to divide the barrels into the number of cubic feet of gas, to get it for each month.

Q 4300 is the average from the date that well came in?

A For that particular well.

Q Yes?

A That is the idea, and on down for each well. Then for October it has the average production for the month of October in barrels and cubic feet of gas, and so you get the amount of cubic feet of gas in the month of October to lift a barrel of oil. Now, we have got to the stage where we have all the gas produced, all the crude oil produced and the average gas-oil ratios, the pressures at the time the well came in. As near as possible, as near as we can possibly make them by using all the data we can find. The pressures in November, using all the data we have available, and the average number of cubic feet to lift a barrel of oil in the month of October, so we have the figure for each well, so many cubic feet of gas left in the ground. Now, we take the number of cubic feet of gas left in the ground, and although we know that this figure will keep on rising, we just assume that this is going to be levelled off, and stay steady at that figure. Now, that is just the absolute maximum that you can get out of it as we showed. These figures are not going to

go up. We just levelled it off. It will not get better. It always rises, every well rises, so it will continue to rise, but I do not know how fast it is going to rise, and I do not know where it is going to end at, because I cannot tell, but I can give you the maximum figure by taking it and levelling it off in November, and dividing the number of cubic feet of gas left in the ground by the October gas-oil ratio, and arriving at so many barrels of oil for each well, which I am quite willing to admit is a maximum figure, the figure I have got will be something less than that.

page 267 follows.

Now the figures are affected by a number of factors, but I shall give you first of all that recovery. It is 3112.6 barrels has been the recovery from the date of the commencement in this area of 1670 acres, thirty-six wells, and the actual recovery to the 31st of October was 3112.6 barrels.

Q MR. NOLAN: Per what, per acre?

A Per acre, and twenty-two million, one hundred and twenty-six point five cubic feet per acre. Now the average pressure in this area is shown on statement Number 3, and when the wells started - that is this factor of a well being in production and another one drilled alongside of it, and the first one having been partly depleted - wells too close together, that is what it really amounts to,- the second well starts off with a handicap, as it has not got the original pressure. So instead of starting up where the first one started at , it starts off something lower. By taking these wells back to the date of their completion we have an average pressure on the whole area of 1842.9 pounds, and in November the average pressure was 1098.6 pounds.

Q In order to make it quite clear that statement Number 3 is in two parts, area "A" and area "B". You are dealing with area "A"?

A Area "A".

Q That is the first page on Number 3?

A We have then slightly less than half of the pressure left.

Q MR. COMMISSIONER LIPSETT: There will be slightly

more than half?

A Slightly more than half.

Q You said slightly less?

A I am sorry, slightly more than half of the pressure left. So that we should have slightly more than an equal amount. We should have more gas in the ground than we have already produced. Instead of getting on this weighted average question, I took each well separately and totalled the gas left in the ground as shown at twenty-three millions.

Q MR. NORMAN: You are on Statement?

A Statement Number 4. Twenty-three millions, one hundred and sixty-one thousand cubic feet per acre. Now by dividing this October oil-gas ratio into the amount of gas left in the ground for each well and adding the totals of the thirty-six wells, I arrive at a figure of 3150.6 barrels left in the ground.

Q Per what?

A Per acre.

Q THE CHAIRMAN: That is where now?

A Statement Number 4, my Lord, at the bottom.

Q Oh yes?

A That gives us then a total recoverable of oil in area "A" taken down to the zero point of 6263.2 barrels per acre. It gives us a total possible natural gas recovery of forty-five million, two hundred and eighty-seven point five cubic feet per acre and a natural gasoline recovery, that is through these absorption plants of 240.7 barrels per acre. Now I wish to explain in the natural gasoline recovery it depends entirely upon the pressure at which the separators are

operated, and this question of the operation of separators can be a very important and substantial part of the revenue to come from all this natural gas, because the figures for natural gas production become very substantial, and with any Conservation Board or with any public body they become a very important factor in dealing with this whole question. I am not clear as to what the future may hold in the way of rules and regulations. I do not think any of us are. But I recognize a number of factors, that we are going to have a lot of natural gas produced with the crude oil, a tremendous volume of it, and that any form of conservation cannot afford to neglect it. The figures in total become, from the present crude area "A" actually produced, become I think, thirty-six billion feet, and there is another thirty-eight billion feet to come. The thirty-six billion feet alone produced in the last two years, and the bulk of it produced in the last year from the crude areas, represent some six years' supply for the Calgary Gas Company system.

Now the total left in the ground is thirty-eight billion feet. I am dealing only with area "A" at the moment, that is this area in here. I wish, however, to point out that this is only one part. There are other portions that I have got covered up here now, up in the Advance area and the Model area, and it is speculation as to how much oil is left up here, but along with that speculation goes this, that part of the area will be similar to area "A" and part of it will be similar to area

"B". So that you will have, along with the crude oil to be produced from the balance of the acreage, no matter what it averages, five thousand barrels or six thousand barrels, you will have a lot of natural gas produced. Why? Because it is in fact being produced with the crude oil to-day. Now to deal with the natural gasoline that is in this gas, it is a matter of what pressure you operate the well at, the separator on the well. The crude oil comes out of the well and goes into a container in which - something like this only it costs twenty-seven hundred and some dollars - it is twenty-four feet high, or thereabouts. It depends on the size. It has baffles in it and the gravity oil drops to the bottom and the gas goes off the top. But that purely mechanical gravity separation does not take out the natural gasoline. If you operate this well at a pressure of one hundred and fifty pounds, the content in the natural gas is about on the average there shown in these wells, about 22 G.P.M.'s per thousand, or 220 gallons per million cubic feet, which is very low. If you operate these separators down at a lower pressure you get a content that will go say .65, and in many cases the average will be about .5. So this amounts to a very large volume of natural gasoline. Now by operating the pressures on the separators high we drop out a portion of these light fractions, so it is caught in the oil and it is taken and placed in the storage tank and it is my opinion a good deal of that is lost in the storage tanks. In many fields in the United States that crude oil is

stabilized and that light fraction is taken out. This enters into the amount of the total recovery in dollars and cents, that an operator is going to secure from the field. Now to take this gas at ten pounds pressure to an absorption plant costs money for re-compressioning, because the absorption plants in the field are now operating at from seventy to one hundred and fifty pounds. So if they take gas at 150 pounds over to the absorption plant the recovery of natural gasoline is small, but them it is lost in the crude oil. Incidentally after leaving the low fractions in you raise the gravity of your oil and you get more for it. If it is not put through the absorption plant it is lost profit, while if it is taken through the absorption plant it enters into the manufacture of high grade gasoline. We have a situation where we have a natural gas measurement. We have the loss that takes place in storage, and we have the amount of cubic feet of natural gas left underground, which are substantial amounts, and there is the natural gasoline to be recovered from it. All that has to be finally ironed out into a system which will enable an operator to make money in securing the crude oil and saving the natural gas if that becomes necessary, and the methods by which it can be paid for. It is my judgment the only method by which the saving of natural gas can be paid for is by the natural gasoline recovered from the gas and its final sale as fuel. I say that advisedly because we hear a great deal about putting

the gas back in the ground to recover more oil, and in general that is not an economic or a feasible plan as far as Turner Valley itself is concerned. I will go into the reasons for that a little later, but I want to make that point, in my opinion, now. I want to turn now to area "B". I have shown that the average recoverable oil per acre in area "A" was, in fact, 3112.6 barrels, and left in the ground was, in my estimate 3150, making a total of 6263.2 barrels per acre. Now the next statement, statement Number 5, covers - it is a short statement covering area "B". It shows 1085 acres on which 22 wells were drilled. The pressures were higher on area "B" and the average pressure at completion on area "B" was 2306 pounds. The average pressure in November was 1686 pounds. I have taken the recovery by each well of both oil and natural gas, and I find that the recovery of crude oil per acre was 1765.6 barrels. The recovery of natural gas per acre was three million one hundred and thirty-seven thousand cubic feet. So that we have an area here which starts off with a much higher pressure. Now the average pressure at which area "A" started off was some eighteen hundred pounds. This area has now reached some 1600 pounds. I have just assumed that this area "B" will produce 1765 barrels. So area Number "A". It starts off now at a lower pressure. So that I am more than safe, in fact I am being more than generous by adding to the production per acre of area "A" all of the production now produced until October 31st from area "B", and the

difficulty of allotting this a definite percentage to it is that I am not perfectly certain about it. I am certain of what it produced. I would rather run to the conservative side than under-estimate these things, so I have added to the production from area "A" all of the production now secured from area "B", and I arrive at some 8028.8 barrels per acre. Now there is an area that Dr. Link mentioned in his evidence, there were 666 acres in here undeveloped or in process of being drilled now, but which he considered this morning definitely proven. I take that 666 acres as being equal to area Number "B", which is 8028.8 barrels per acre, and we then add the total of this area tp the total nu ber of barrels produced up to the present, and the estimated total barrels in there that we could recover. I pointed out that this I believed to be the maximum figure. So we have a recovery from these three areas, from area "A" 10,459,544; from area "B" 8,711,356; and from the 666 acres to be drilled or proven 5,347,247 barrels. Now that total amounts to 24,518,148. That is all included on page 15 of this report. To these two areas down here we have to add these areas in the North end which have been producing for some time, and still have a reserve. That is the Advance area and the Model-Spooner-Reward area at the North end here. So that we have to add the amount of oil that has been produced from the Advance and Model and Royalite 29 and all these wells up here.

Q MR. NOLAN: Is that the Model-Spooner-Reward or Model 1?

A Model 1, I am sorry. So that we have a total acreage in those areas of 202 acres which, being as it is on the East side of this crude oil area, I have estimated again at 6263 barrels per acre, which gives a total reserve in the ground when they started as one million, two hundred and sixty-five thousand, one hundred and sixty-six barrels. Total proven reserves of crude oil in three thousand nine hundred and thirty-three acres explored amounts therefore, to twenty-five million, seven hundred and eighty-three thousand, three hundred and fourteen. Of this reserve seven million, eight hundred and seven thousand and eighty-two barrels have been produced to October 31st, 1938. The proven crude oil reserve remaining, therefore, amounts to seventeen million, nine hundred and seventy-six thousand, two hundred and thirty-two barrels, and the recoverable crude oil from the three thousand nine hundred and thirty-three acres amounts to six thousand, five hundred and fifty-five barrels per acre. I want to point out one more factor and that is that the pipeline this year, 1938, will take approximately five million, five hundred thousand barrels, so we have actually in sight that we can go and put our hands on of something over a two years' supply. Then we have an additional year from this six hundred and sixty-six acres being drilled now, and to be drilled, that Dr. Link thinks proven acreage, and will produce at or near the estimate that he made. So that is a third year for this pipeline at the current rate of five and a half millions shipped in 1938. From then on wells have

tobe drilled to provide oil for the pipeline and for the market, and so I come to the question - but before I come to the question of cost of all this, I wish to be sure I have made myself plain as to the method of arriving at the reserves and all the facts that we have put in. If it is clear, my Lord?

THE CHAIRMAN: Make your own summary if you are in doubt.

A The question then, as I see it is that we have dealt with three thousand nine hundred and thirty-three acres. They are proven, been drilled up. There have been four dry holes in the area, and we have taken that all into account, dry acreage and profitable acreage. It has all been dealt with. We have the production to date. We have the actual production of natural gas to date, and the actual production of crude oil. That I gave you. The production of natural gas I will now give you. On area "A", Page 18, forty-five million, two hundred and eighty-eight thousand cubic feet, area "B" forty-eight million, four hundred and seventy-one thousand cubic feet per acre, and the undrilled 666 acres, forty-eight million, seven hundred and forty-one cubic feet per acre, and from the three hundred and ten acres that have been proven dry by four wells which were nil and the the Model and Advance area, two hundred and two acres, forty-five million, two hundred and eighty-four thousand cubic feet per acre. The total recoverable oil from the area is twenty-five million, seven hundred and eighty-three thousand, three hundred and fourteen barrels, of which seven million, eight hundred andsseven thousand

and eighty-two barrels have been produced. The total natural gas production possible is 170.1 billion cubis feet, of which 56.5 hillions has already been produced, and one million, two hundred and sixty-three thousand, seven hundred and fifty barrels of natural gasoline, of which one hundred and forty-one thousand and sixty-three barrels have been produced, that is actually recovered. More than that has been produced, but it has been burned in the air. The average recovery per acre is as follows: Possible recovery 6555 barrels of crude oil. 43.2 million cubic feet of natural gas, and 321 barrels of natural gasoline per acre. Now the question of how much it has cost, the cost of drilling. I agree with both the previous witnesses as to $165,000.00 the cost per well.

Q THE CHAIRMAN: Before you enter upon another subject, you say that this is the recovery which there should be in respect of wells already drilled?

A Yes, my Lord.

Q And in this respect of what you call the possible area, how are you arriving at what number of wells will be drilled?

A That is the great difficulty now, who is going to put the money up to drill those wells.

Q That is a practical thing is it not, in connection with the pipeline. You are giving us figures on an area that you treat as possible?

A Yes, my Lord.

MR. POLAN: Proven.

A I have given you the figures on the proven area.

Stanley James Davies.

Q THE CHAIRMAN: The proven area, yes. You have given me the figures on only the proven area?

A Except the 666 acres which Dr. Link considers proven and included in this red on this map here and joins wells shown on my area "B".

Q You are accepting his view about that?

A Yes, my Lord.

Q Now, what about the area that we have had described as possible? They are not taken into account by you?

A I have not given you any estimate on them, no.

Q I have not had an opportunity of course of examining your report, as a whole. Do you?

A No, I don't. I state only this that there is no method by which the oil in this possible area can be estimated except by the examination of the performance of those wells now drilled in part of that area.

Q And will you in time express opinions about that or not?

A I have not expressed an opinion.

Q All right?

A Do you wish me to continue, my Lord?

MR. NOLAN: I was going to suggest as a new subject is about to be introduced perhaps this would be a convenient time to adjourn.

THE COMMISSIONER: Very well.

(At this stage the Hearing was adjourned until 2 P.M.)

.....

STANLEY J. DAVIES, having been recalled.

Q THE CHAIRMAN: All right, Mr. Davies.

A I wish to bring out a number of factors that qualify the reserves in the ground, in the figures I gave this morning. The first factor is what happen with these present crude wells when they reach a pressure of 300 pounds, bottom-hole pressure, and again I shall refer to the actual evidence of a number of the wells which were located in the gas-cap proper but which have produced crude oil and they have produced crude oil for a period of, in some cases a year or in some cases eighteen months. They are wells which, one well which was completed before Turner Valley Royalties, just over a quarter of a mile East of it, higher up on the structure, and it turned from a naphtha producer to a crude producer, and produced crude oil for some eighteen months and I want to show you exactly what happened in the well itself as having a bearing on what is the tendency that can be now observed with these crude wells when they reach pressures of below 450 pounds, bottom-hole pressure, in the neighborhood of 300 to 450. We do not know exactly because we have not had measurement of these wells but we know it is below 450. This graph, part of Dr. Link's exhibit, illustrates the decline in gas production. This the decline in the pressure and this is the decline in the oil production.

Q MR. NOLAN: What well is that?

A Century Royalties No. 1. It produced some eighty

barrels a day in November 1937 and in November 1938 it was only 11 barrels. Another well that is not far distant to Century---

Q THE CHAIRMAN: To what do you attribute that, in simple language?

A It is the power of this gas to carry oil into the hole at certain pressures. The gas and oil separate at what we term the critical pressure, that starts at 2600 pounds as a matter of fact, but when you get down to low pressures the gas, as we say, by-passes the oil, leaves it back in the formation and you have practically a gas well. That is happening in a lot of these wells described in area A.

Q Yes.

A They are turning really into gas wells.

Q The oil is left in the structure?

A Left in the formation.

Q Because it is not being forced up by the pressure of gas?

A Quite correct, and it is the most serious factor we have to contend with in the production problem of Turner Valley. The oil is left in here. It is not a blanket formation. How are we going to get that oil in that well? I propose to deal later on with all the known methods which I can think of or know of as to what should be the proper procedure to be followed dealing with the production problem in Turner Valley which is a most important thing as you can see.

There is another well which illustrates the same thing.

Here is the graph of the production---

Q What well is that?

A Richland No. 3 and here is its production. I will give you the monthly figures. In a year it went from three thousand barrels in a month, I will give you the exact figure, Richland No. 3 in August of 1937 it produced 5669 barrels; September 7388; October 4783 and then it just shows a regular decline until October 1938, 148, which is just three barrels a day. Now at the same time in that month of October 1938 it produced 93,000,000 feet of gas, it is still a fairly good gas well, while in October or we will take back to August, we will take the highest figure it had, which is October, 1937, 176,000,000 feet of gas in the month, so this well changed. Now we have got to the point here where there are three barrels a day. The only value that is left in that well is as a gas well for sale of gas and quite naturally the gasoline which is in that gas which to be recoverable must be recovered in an absorption plant. Those two wells are the only two that have, that are definitely below 450 pounds in pressure. We have two more which are 562 pounds, B. & B. and Turner Valley Royalties and they show exactly the same tendency for the gas-oil ratio to go away up. In other words the oil production per day drops off until you virtually have a gas well. Now the problem is if you shut these wells in----

Q THE CHAIRMAN: Now has that proven to be true of all the wells in the vicinity?

A All show the same tendency, my Lord, everyone of them,

without any exception, everyone shows the same. Here is one of the best wells in the field, Advance No. 2, and one on which we have very complete information. Here is the decline in barrels. This is the way it is going down. Here is the gas production. It has been an excellent well. I will just read these figures because they are important. The well has produced 393,000 barrels of oil and it has averaged, it has produced 932,000,000 feet of gas, which puts an average of 493 cubic feet to produce a barrel of oil but when it first started this well took about 1200 cubic feet of gas to produce a barrel of oil which is quite low and in October 5500 cubic feet per barrel of oil. Now that is one of the best crude wells in the area but the tendency is still there. Now that well still has a pressure of 1180 pounds and the point I have just raised is that when that pressure gets to below 450 pounds we have this sudden dropping off in oil production and the gas, the well becomes a gas well, so that the figure that I gave you this morning as to oil recoverable or left in the ground must be qualified by the remarks which I have now made as to what point of these wells, when they get below 300 pounds, to be quite safe with this 450, we will go to 300 pounds and you will see when I take my pressure drop from we will say 1100 pounds to zero, if I had left it at 300 pounds, my recovery figures would have been still less. Now I do not say that the oil is not there in the ground. I say the oil is not being brought into the well and

that is a fact, and that is all I am concerned with is recoverable oil and it is very important and a difficult thing to evaluate.

Q THE CHAIRMAN: It is left right in the rock structures.

A Yes, that is my opinion, my Lord.

Q And not forced up into the holes of which we have heard.

A Quite my Lord.

Q Then it is not getting into the well proper?

A Right.

Q And if so, you can never pump it?

A Quite correct. Now you have brought up a most important point. As these bottom-hole pressures drop, my Lord, the fluid level in even the highest pressure well, keep on dropping in the well, and these wells that I have referred to, such as Century and Richland, have no fluid level in them. There are a lot more, these marginal wells of all high gas oil-ratio as Advance and Sterling No. 3 have none. It is a most important point you have touched on there, my Lord. The liquid is not brought into the hole.

Q Well now then the lack of pressure, which is the volume of gas I take it?

A We get into a very complex chemical problem and this is my understanding of it, at very high pressures natural gas goes into solution as crude oil and it also in part forms a complex chemical compound. Now natural gas has a pacific gravity of about 6 tenths of that of air. It is quite light and oil is about 8 tenths of that of water and when you mix those to-

gether in a solution it is much lighter and more fluid. It will flow very, it will flow more rapidly, my Lord, because of the nature of this combination of solution and complex chemical substance. Now when we have a block of limestone and this is at a pressure of 2500 pounds and we put a hole into it, if we control the rate of movement to the bottom of that hole so slowly that gas and oil do not have separate existences, we call that the critical point, of the critical pressure when they separate, if we control that movement so slowly that the gas is the propellent, it will move to the lowest pressure place and carry with it its associated crude oil molecules and in so far as they are more fluid they will pass through the small pores and that has a very important relation to this problem of permeability that they were talking so much about. Now you go down and draw that quickly and you draw that gas into the bottom of the well, it gives your gas-oil ratio, and your oil is forever left back in there.

Q Subject to what you may yet have to say as to means of getting other propulsion, it will forever remain there.

A It will forever remain there. Now one thing further---

Q Is the pressure that makes for that cohesion of oil and gas, of which you have spoken, is it localized, that is you spoke of one well showing a decline over a period of time and you gave another example of another one, take a new well put down beside either one or the other would it have a high pressure to begin with?

A No my Lord.

Q Or is the hole locally propelled?

A The whole locality is probably relatively, I will explain what I mean, if these are the two wells, A and B, this has a thousand pounds pressure and this 1500 pounds, this well in here will probably have 1250, it may have 1300, it has been known to have higher than this one, 1600 pounds, and if that is the case, this will be a small well because it will be a little localized area and when they commence to draw on it down will go the pressure. Royalite 31 is a good example, on the West side of Turner Valley, down goes its pressure, small production, but if there is a big drainage area to this one then this one is brought in, say like Davies No. 2, a really good well, bring this well in and it will have somewhat near the production of this one. I am not speaking of half a mile or something, I am speaking now within 660 feet or thereabout. If you get a half a mile away then that is quite different because there is a relationship within a short distance, my Lord, very clearly, but get a quarter of a mile away and the rate of travelling is so slow that it will equalize perhaps over a ten year period but certainly we have had ten years and it did not equalize. Now I want to be clear about that---

Q Just before you proceed, can you say what that distance would be.

A I would say a quarter of a mile. When you get further than a quarter of a mile, no, I will go further my Lord

and say that that distance will vary, whether you are on the top of the structure or away down on the flank of the structure. That was the point that my friend Dr. Link brought out when he said that there was more fracturing on the top of the structure and it would cut the top pores and the bottom pores and furthermore I can go further and say that North and South that fracturing is much greater, has a much greater effect, than it has East and West, so on the top of this structure you can go to a half a mile, where the structure is crumbling and breaking, but I would limit it to a quarter of a mile and we want to give you the evidence of that quarter mile limitation now, my Lord. When Turner Valley Royalties----

Q MR. NOLAN: Would you like to show it on this map here?

A I would like a bigger map, what I want to get is the difference in pressure of wells, a bottom-hole pressure map, that is really what I want.

Q We have one there?

A Yes we have. Here we are. Now these were for the year 1936 I think. There are two of them there.

Q There is a date on it, on each one of them on the top left-hand corner.

A This is July 1936, and this represents 2500 pounds.

Q THE CHAIRMAN: Just a minute, we want to know what we are speaking about, this is part of Exhibit "15" is it not?

MR. NOLAN: Exhibit "13" my Lord.

THE CHAIRMAN: Is that an exhibit by itself?

MR. NOLAN: Yes my Lord.

THE CHAIRMAN: That is not one of the charts.

MR. NOLAN: No my Lord.

THE CHAIRMAN: There were charts put in by Dr. Link.

MR. NOLAN: The witness is now looking at Exhibit "13" and "14", my Lord, which are bottom-hole pressure contour maps.

THE CHAIRMAN: Yes.

WITNESS: Now you will see that he has, these represent a thousand pounds bottom-hole pressure, you will see that he has 1500 here and then 2000 pounds, this being the condition that existed in July 1936. Now this map here, that represents one mile so that you will see what a gradual drop there is in bottom-hole pressure and the change as you go East and West. Now North and South in this top area you see this pressure is about all the same, this is between a 1000 pounds and 1500 in the whole area. It travels easier North and South due to fracturing than it does East and West, and the pressures here are due to the slow travelling. Otherwise it would all be equalized right now. Here is one, that is perhaps more hypothetical than this one, this is actual facts, measured, and you have the same sort of thing again there, here you have 500 and then 1000 and then 1500 and 2000 and 2500, so that you have, and it will be true to state that, as you go down the dip the original bottom-hole pressure was greater than this, it might have been 500 pounds greater than all this, that we

[illegible]

[illegible]

[illegible]

do not know, but we do know what they are now.

THE CHAIRMAN: That is on Exhibit "14".

A Yes.

Q THE CHAIRMAN: As I understand you if you get a quarter of a mile away from say a well that is under consideration, the gas which provides the pressure will not so permeate to where you are putting another well a quarter of a mile away, a quarter of a mile or more, so you would practically have a virgin field with the pressure that you would at any time have had.

A That is very close to it, that is a quarter of a mile, now that is a quarter of a mile apart, in this one-area of forty acres -

(Page 288 follows)

We have to come to a point that that is tied in with the cost of wells and the recovery per acre and we might find, my Lord, that it would be the sensible thing to do to put those three-eighths of a mile apart instead of a quarter of a mile. You do not need to just sit on a limit of one quarter of a mile, but you have the thing correctly summed up in my judgment if you put another well a quarter of a mile away and this drop in pressure will not be great. I will go a little further and say if you drill a well "A" and say it runs for two years - and time enters into this as well, my Lord, and if at the bottom of the well "A" the pressure was only 500 pounds, then after a period of two years you might have the effect of a little bit more than a quarter of a mile.

Q THE CHAIRMAN: As far as experience has yet taught you have not any appreciable one?

A Not an appreciable one. As you are going West we find these pressures high up, going Westward You go North and South on top and that is a different story altogether, but in the crude oil districts you go North and South and it makes very little difference. There is this to be said, you get two wells half a mile apart and drill them and this one has a pressure of 2000 pounds and this one has 2500, it is not very sensible, it has been done, but so far the results have not been satisfactory, drilling in between. But it has been done. The wells are still a quarter of a mile apart. But the time element enters in there. You drill this

well in and within three or four months time you drill this and after the coming in of that you drill that well in there, and these wells have perhaps been flowing for a year and this well in here you will not get very much out of it. The oil-gas ratio rises too fast. I will give you an example. You take Brown Number 4. That is in a similar position with Prairie and Firestone, and Westside, Brown Number 4. Westside has been a reasonably good well. Prairie is an excellent well. Brown Number 4 came in about, I will read the production figures. 13,997, 10,300, 12,522, 15,080, 16,244 and 12,356. Gas production month of October 44,853,000 and point something. Now the total production is 86,911 barrels, and 231,403,000 cubic feet of gas. This oil-gas ratio has already raised to a point where the remaining recoverable oil is affected, because that gas is what brings the oil in there, and he has too high a gas-oil ratio to get the proper recovery as against Prairie which is a quarter of a mile away.

Q I take it you advise - I hope I am not interfering with you?

A No, my Lord, I am delighted.

Q I must ask you these things as they occur to me because I will forget them if I do not ask you. As I understand you the effect of your evidence is all the estimated reserves of oil may be wholly inaccurate, no matter by whom made, unless the withdrawal of that oil is attempted in such a fashion as to keep the oil and gas together?

A Correct, my Lord. I must say, my Lord, you have got

a very good grasp of the problem facing us. I wish to deal somewhat with the question of the amount of natural gas that maybe present down structure as to on top of structure. That is illustrated by that diagram over there, and I want to read the figures of three wells, and it will qualify to perhaps some considerable degree the gas reserve figures I gave in my area of "B" and this 666 acres of undrilled lower down structure, because I do not know how many cubic feet of gas is in that rock down below. I know how much is being produced, and the estimate I gave may be quite incorrect. But there is some evidence which I can place before you which I think will be of value. I want to take three wells. This time we will take them across the structure. We will take one right on top, which is Highwood Sarcee Number 1, and take this well, Davies Number 2, which is an excellent well, and I will take a well still further down in this high pressure area, Royal Canadian Number 1. The position of these wells is, as you see, Highwood Sarcee is three-quarters of a mile from Davies 2, and Davies 2 is half a mile approximately from Royal Canadian. Royal Canadian is one of those Westside wells, and a very good one. I shall read the record of production, of the total amount of gas and oil produced by all three wells up to date, and it will give you some idea of the proportions present in these respective parts of this Turner Valley limestone. Along with the record goes some idea of the pressures in which these two components were placed. Highwood Sarcee Number 1 had a closed-in pressure when completed

of 1620 pounds in July of 1934. Now I am quite willing to accept Dr. Boatright's suggestion of 200 pounds in addition for the bottom hole pressure. It certainly would not have a bottom hole pressure of more than 1820 pounds.

Q MR.NOLAN: Are you reading from Statement Number 6?

A Statement Number 6, yes sir. It has produced to date twelve billion, three hundred and eight million odd cubic feet of natural gas, and the total recovery of naphtha and plant product of 222,676 barrels. Now it has a rate of pressure, of closed-in pressure of around 400 pounds. That is the well I mentioned this morning on which you have to base that fifty barrel per million feet of recovery at 36.1 per cent. I want to read to you the record of Davies Number 2. This is one of the wells in area "A". 393,059 barrels and 932,702,000 cubic feet of natural gas. Now I shall read the records for Royal Canadian Number 1.

Q MR. NOLAN: Is not that in area "A".

A That is in area "B" now.

Q That will be Statement number?

A That will be part of.....

Q The second page of Number 5?

A It is given in that and also in the record of the well in Statement Number 1. Royal Canadian Number 1, the ninth well in Statement Number 5, 140,764 barrels, and 188,279,000 cubic feet of gas. You see the proportions are quite different, my Lord. As we go through we get less gas and more oil.

I think it will be probable that the gas recovery figures I gave for area "B" will be quite incorrect. It will be too high altogether. The oil recovery figures will also probably be too high. I have given 8,028 barrels per acre. I want to point out that this increase of cubic feet per barrel of oil is going on in the highest pressure well just the same as it is in the lower pressure wells up on the surface and the rate of increase is approximately the same. I want to read from one well, the Globe is a very good example. I want to read from the record of production.

Q Globe is in area "B"?

A Globe is in area "B", and in July 1938 produced 10,074 barrels with 7,884,000 cubic feet of gas, which, you will note, is less than one thousand feet of gas per barrel of oil. In August it was 9,528 barrels for 5,745,000 cubic feet. Quite a low gas-oil ratio. In September it was opened up too wide, my Lord, that is one reason,- 7,924 barrels with 21,000,00 cubic feet of gas, and in October 7,253 barrels with 19,550,000 cubic feet of gas. That is in area "B". I have dealt with the factors which qualify the estimate of recoverable oil and natural gas which I have already made. I wish now to deal with the question of what might be done and what should be done in any program of recovering more oil and utilizing this energy to better advantage. In other words, I have outlined in some detail the principle in the report of the necessity of doing it and I wish to describe now the condition under which this necessity will have to be applied.

In the first place when a well comes in is the day of its highest pressure, and from that day throughout its lifetime this natural gas that is in this formation has to be conserved from that day forth. Not two weeks afterwards or two months afterwards or two years afterwards, that is no good. Many of these wells will have no lifetime after two years. So that the day the well comes in, the rate of production should be at its best, or the lowest number of cubic feet of gas per barrel of oil, and without any change whatever that best figure is the figure to operate at regardless of what the market is, regardless of how many barrels you want to sell. Otherwise that oil is forever left down below in my judgment, forever left down below. It is a question of taking more dollars out of an investment over a longer period of time rather than grabbing fifteen cents now, and in some instances that is about the proportion they are going to get of the value of their investment. How how and by what methods may this be encouraged or arrived at? Obviously it is a matter for the companies themselves. But what you cannot have is one operator in the middle of another group of operators letting his well go wide open. That, of course, gets back to this quarter of a mile area, and it is fatal for all of them. So some measure of control is necessary. At the same time we will take all the operators and what can they do? There are a number of methods and the Royalite Oil Company or the engineers of the Royalite Oil Company have, I understand, investigated fairly and completely the problem of placing a pump on a well at or near

the time of its completion, so that they can from the day the well comes in start to assist this oil to come to the surface and release the necessity for the gas to do all this work. They will do it mechanically. It will add to the cost of production, and the results, my Lord, we will have to wait for. The only way of getting the actual data is how many pounds decline and how many barrels of oil were recovered. That is in the future. I would safely say this that I believe that pump is actually on order, and that they propose to try it. That is the first step. The next step is this that as a general thing for the field itself no figure of production should be set which is beyond the proper engineering maximum production efficiency for the crude oil area. I want to make myself particularly clear on that point. If the proper figure is 14,000 barrels a day to be drawn off the crude area, then 14,000 barrels a day it is, regardless of whether they could sell 24,000 barrels a day. I want to go back to what happened last Fall when the Conservztion Board ordered 28,300 barrels per day and the pressures started to sink. Of the number of crude oil wells there were only three that could make their allowables. Of this 28,300 barrels per day, and 22,000 barrels per day they were 45,000 barrels shy on October 20th, at the end of that period. So you see what happened to those wells. It destroyed the efficiency of production. I might say this, the Royalite Company refused to allow many of their wells to operate that way, and did continue to operate at the efficiency

basis. To all producers of gas what one man does affectd another, Then your first principle is the efficiency of recoveryng that oil. Now to do that and to adopt efficient methods we will find ourselves in the position that throughout the year we should have that efficient method steady each day by day throughout the year. You do not put these wells up and down. Putting them up and down does them harm. But whatever the best recovery per barrel of oil, that is it. That is now described as pressure maintenance. It is seldom used in this country, that term, maintennce of pressure, in Turner Valley.

Q MR. COMMISSIONER LIPSETT: Is it that the Conservation Board ordered 28,000, did you mean that they actually ordered that much to be produced, or merely permitted that much?

A I would be correct to say they permitted that much. I do not know that they could order you or force you to produce uneconomically, but they did permit that.

MR. NOLAN: That is what is known as the allowable.

MR. SMITH: It perhaps might also be fair to say they were required to do that, by stating it was not the Board's judgment, but they were required to pro-rate for the market requirements. That is not in the new Statute.

MR. FRAWLEY: All of which has now been changed in the present Conservation Act.

THE WITNESS: Now we come to the question of re-pressuring which we hear so much about.

THE CHAIRMAN: Before passing on you say

that whether through Government agencies or otherwise there should be some way of fixing this proper admixture of gas and oil?

A That is right.

Q Has experience shown in any of these wells a drop in pressure and so on that they ever ran out of gas?

A The Western wells.....

Q I take it at first you have the most nearly proper admixture of gas and oil?

A Yes.

Q Then you are getting more and more of a gas well?

A Yes.

Q And I suppose less oil content in the gas all the time?

A Quite right.

Q Until you are finally down to a gas well?

A Yes.

Q Do you finally get to where you egen have not got a gas well?

A We have not got to that stage yet. It will come. We have not got to those low pressures yet. When you speak of where do we run out of gas, the wells on the extreme edge are very low in their amount of natural gas, and what usually happens is they acidize those wells to get them to flow. Some of them have to be assisted to flow by adding gas which is called the gas-lift method. Others have been acidized. As a whole, acidizing increases this gas-oil ratio factor. It apprently helps to separate the gas from the oil, the very thing we do not want to do, but it brings enough gas in there

to allow these wells to flow. That has been the effect of it. So that in a good producing zone and a good well, acidizing would help to recover your oil in a shorter period of time, but with less over-all oil. These figures are not final, because we are not through producing, but it certainly has put up the gas-oil ratios.

Q You think when they acidize and increase suddenly the flow of gas that they do that at a cost of a considerable portion of oil which is left behind?

A That is correct, my Lord, I do. On the Western edge of this area helping the area with pumps from the date of completion with the gradual increase in the gas-oil ratio, which is characteristic of the field, get you to the point where a well will finally flow. That is just the opposite of the average conception of an oil field, and is one of the reasons that Dr, Link stated that this was a gas field and incidental crude oil production, which is exceedingly the case. Normally you have, as Dr. Link explained, the gas come off and you get oil and then you get water. Here we have crude oil and a gradually increasing quantity of gas, and as you, my Lord, have expressed it, they finally become gas wells. That is an upside-down proposition as far as the production of crude oil is concerned. But it does this very quickly, it wipes out this long tail end of production of 10 barrels and 25 barrels per day, and three barrels per day, because that is not economic to operate these wells and dispose of the natural

gas, because gas wastage, the wastage of natural gas becomes a very important factor. Incidentally, the present method of shutting in a well that takes so many cubic feet of gas, leaves behind in the ground a great number of barrels of oil which can only be recovered by bringing that gas into the bottom of the hole. There is no other way of recovering it. Let me again say that gas does not move from a low pressure area into a high pressure area. Gas will always move to the lowest pressure regardless of whether it is uphill or downhill. It makes slight difference. It will move to the lowest pressure point. Now it has been conceived by some that by pumping gas back into the ground you can recover more oil. Well, that principle is known as re-pressuring, and I want to examine it in some detail, because it is tied up so closely with the question of conservation, and so closely with this point of recovering more crude oil from the formation.

(Go to Page 301.).

Now, if we were to take a well such as Richland 3, or still better, let us take Highwood Sarcee No. 1, the reason I have it in here is to illustrate this point, it has produced twelve billion feet of natural gas, some odd million, but twelve billion is near enough, with about 400 pounds pressure, and that well would be a good place to pump gas back in, but you will notice to pump that gas back in an enormous quantity of natural gas would have to be pumped back in before it would raise the pressure back. Now, we have 400 pounds, we are dealing with Davies No. 2 here, which is located here, my lord, and this is 1180 pounds. All the gas you like to pump in there is not going to effect Davies No. 2, so that you have, - we will stop just for a moment there, you can have a tremendous wastage of natural gas, which on the total has been from areas A and B, some thirty-nine billion feet, has been wasted in producing the oil which has been produced from these two crude oil areas. That gas can be pumped back into a low pressure area, but its principal value would be as fuel reserve for the future, that is its principal value. There would be an incidental value of the amount of natural gasoline which was in that gas taken out, as it was treated in the absorption plant before being pumped back into the ground.

Now, the reason that it will not recover more oil is simply this, and I put in statement No. 6 in the record, the record of Highwood Sarcee No. 1 well, and this is one welliin which I have been personally intimately associated, and the record is complete, and

you will notice that at 1300 pounds on the well that the gasoline content going to the absorption plant was only .05, but that when it reached 1100 pounds the gasoline content was 1.12 going to the plant and somewhere around 1100 pounds, a little better, was the critical pressure at which this, - and above 1100 pounds, - at which this point of renegade condensation which was so ably described by Dr. Boatright took place and, therefore, to take it from that formation this gasoline which wets the inside of these little holes down there, you would have to get pressure above 1100 pounds, and up to our original pressure of 1520, closed in pressure. Now, we would have to pump back in there a lot of gas to do that and that costs money and at the moment we see no one to pay for it. Its only value will be to sell to the Gas Company system perhaps fifty years hence. Now, it has been said if you close in the wells on the eastern border here that you will have reduced the wastage of natural gas , which is true, you do it also at the expense of the oil which is left in the ground. The question which I ask is, on the basis of recovery placed before you, can you afford to do it, because of that 6,263, - I have to look that up every time, 6,263 barrels, of recoverable oil in area A you will be shutting in and leaving in the ground a certain portion of it when these wells become gas wells. To take an example, Model Oils, Model Spooner Reward No. 1, and I want to read the records.

Q MR. FRAWLEY: Might I interrupt, I am not following

very clearly your two areas, but I understand you to say if you close in the gas-cap it would save gas, but at the expense of the oil in the ground, do you mean the crude oil in the west flank or the naphtha in the gas-cap?

A That may be true with regard to the gas-cap, but it is also true with regard to Area A, which I am referring to at the moment, which is part of the crude oil area.

Q It is part of the crude oil area?

A Part of it, yes.

MR. NOLAN: Mr. Chairman, I am quite sure the witness would like a break if it is convenient to the Commission. It is very tiring.

WITNESS: I would appreciate it very much. I get tired after a certain time.

THE CHAIRMAN: We will take five minutes recess.

(The Hearing here adjourned for five minutes.)

Q THE CHAIRMAN: All right, Mr. Davies.

A We were dealing with the question of Model Spooner Reward No. 1 well, and I wish to read from the production figures.

Q THE CHAIRMAN: What point were you making about that?

A It is one of the wells that is classified under the order of the Conservation Board as a gas well, and I want to illustrate the number of barrels of oil which will be left in the ground. I have it right here. The record of production commences in October, 1937, and for the month of October, 1938, the production

- was 5,679 barrels, and the production of natural gas was 173,800,000 cubic feet of gas. Now, that well has produced a total of 118,862 barrels, which you will note is less than the cost of production. We will deal with that in the next phase, and by shutting in the well as a gas well we have the problem of part of our recoverable reserve mentioned to you, 6,263 still in the ground there, and I know of no method of recovering that crude oil except by the production of the well, which brings us to the point then of where a great deal of the area progressively, month by month and year by year, we have more and more wells in the classification such as that, and the problem of shutting them in and leaving the oil in the ground is one which does not commend itself to me as being an economical proposition, and by the amounts given you or the amounts given you must be reduced by the amount of oil which is being left in the ground as a result of any conservation Board order. So much for that phase of the question.

I wish to deal now with the cost factor. At page 16 of the report from Dr. Link's figures the area left to explore in Turner Valley amounts to 13,922 acres, of which 666 belongs to this proven area, and 70 wells have been drilled to explore 3,265 acres, or an average of one well to 46.6 acres. Now, on the basis of one well to 40 acres, a total of 348 wells would be required, A few of those wells are already drilling in this proven area down here. The cost of these wells will vary with their depth, but

on the average, and I have gone very carefully into this figure, the cost will be $165,000.00 per well for drilling alone. This will require a total capital sum of $57,420,000 .00. Now, the only possible saving that I am able to contemplate is by wider spacing the well. There is no scientific basis for one well to 40 acres, that is just a blank guess based on our land ownership.

Q THE CHAIRMAN: On legal subdivisions?

A Legal subdivisions and the possible consideration, every possible consideration, that reduces the number of wells to be drilled, we are dealing with the ideal situation, my lord, the whole of the balance of this undeveloped acreage would be unitized, regardless of ownership, wells would be drilled on the very best geological information and spaced as scientifically as we know how, and that is the first step towards an economic, seientific development of the balance of whatever acreage does prove to be productive in Turner Valley.

Now, the lifetime of Turner Valley, which is something which interests this Commission very particularly with regard to the lifetime of this pipe-line, is reduced by the figures given to you to two years certain, you can put your hand on, one year that is highly probable, almost certain, the balance depends entirely on the rate of drilling new wells. The rate of drilling depends upon the funds available and that is completely outside the scope of my knowledge. Now, to continue to supply Western Canada markets alone,

which is taking some 5,500,000 barrels in 1938, and there is a good deal of oil imported into the west, I have used the figure of 6,000, or 6,000,000 barrels a year, it is necessary then to drill a sufficient number of wells each year based on the average recovery per acre that we know, to keep up the supply for our markets in the west. Now, take the average recovery of 6,555 barrels per acre, and an average of 46.6 acres per well, which was the average on the 3,265 acres already developed, the average recovery per well amounts to 305,463 barrels. On the basis of 40 acres per well the average recovery amounts to 262,200 barrels. This recovery must cover the cost of gross royalties, and many of which are 25% in Turner Valley, - that is one of the principal drawbacks to the development of Turner Valley, there are too high gross royalties. You will think about it. It is a clear profit to someone who does not put up any money for development, and on the recovery which we find from actual results we cannot afford to pay that profit. It must cover 165,000 per well for drilling costs, or production expenses , and we have placed a figure of $50,000.00 per well during its full flow lifetime. If some of these pumping methods are added to the methods of producing oil from the beginning of the lifetime, we would have to add to our $50,000.00 per well the production expenses and taxation, which is a very considerable sum, when you consider we have school taxes, to give you an example of these small wells in the south end of Turner Valley we have a tax bill of

$500.00 a year, that is just, that is outside of income taxes or anything like that, just plain municipal taxes and school taxes and pipeline taxes and local improvement taxes. Now, on the basis of 40 acres per well it would be necessary to drill 30 wells a year in order to sufficiently, safely supply 6,000,000 barrels a year because some of these wells are going to be dry holes. I have worked out the per centage of acreage of this 3,933 acres which is dry, and it is 8%. Now, as is very clear from Dr. Link's evidence we do not know where that dry acreage will be, it may be any place, so you cannot go and say "But I will not drill a well there because it is going to be dry", You drill the well and then you find it is dry, so to safely supply 6,000,000 barrels a year we have to drill 30 wells a year and on the basis of $165,000.00 per well it requires an annual sum of $4,950,000.00.

Now, in concluding.....

Q THE CHAIRMAN: I suppose whether that drilling is done or not, it depends on whether it is profitable to do it or not?

A Most assuredly, sir. From the figures given a few wells are highly profitable. The majority get their money back and that is all. A great number never can return the capital cost of the well. When you consider all the factors that enter into the supplying of funds for the public development, development by the public, such as 25% royalty, and a portion of promotion stock and so on and so forth, the general principle will be, from the records to date, is that public funds put up into small companies in Turner Valley, the money will be

largely lost.

As far as the Royalite Company is concerned, they only own a relatively small percentage of the acreage which is undeveloped, and this drilling has to depend on other companies and to the public supplying the funds, that is all, my lord.

Q MAJOR LIPSETT: Just before you finish on that subject, about the 30 wells per year, Mr. Davies, if each well produces 305 barrels would not about 20 wells give you your estimate?

A Quite right, that is on the 46.6 acres basis.

Q THE CHAIRMAN: You are allowing for dusters?

A Yes, my lord. , you cannot tell in what year you might get them.

Q MAJOR LIPSETT: You talk of 46 acres, on the 40 acre?

A That is the 46 acre, that is on the basis of one well to 46 acres. The present basis is one well to 40 acres. Now, if you have to allow for some protection in there, of wells that are going to be dry, because we will take one year, everything looks beautiful, all drilled wells come in, but now you take this year, 1938, a lot of very mediocre wells have been drilled.

(Go to Page 308).

There is a great deal of unemployment in Turner Valley. I happen to be managing a little gas utility in two little towns in the south end of Turner Valley, Little New York and Little Chicago, and we have ample evidence of so many people unemployed because drilling has practically ceased. New wells are not starting up at anything like the rate they were when these wells were first coming in and when it was so good. So we have quite a serious problem to consider.

Q MR. NOLAN: That figure of 305,464 barrels is the average recovery over the lifetime of the well?

A That is correct.

Q It is not an annual recovery?

A Oh, no.

Q MR. COMMISSIONER LIPSETT: If you have that much in every year with what you have got already.....

A You would have to keep it then. Furthermore, that is subject to qualifications as to the amount of oil that you will be forced to leave in the ground owing to all these various things I brought up this afternoon.

Q THE CHAIRMAN: What do you suggest as the proper method of control to preserve this field?

A This would be my own personal opinion. I am not expressing any opinion of anybody else except myself personally.

Q Certainly not. I take it that that is true of all your evidence, Mr. Davies?

A Completely, from start to finish.

Q It is quite immaterial to the Commission who may have asked you to come, you are giving your opinions and not theirs?

Not theirs. I should have made that plain at the beginning. With regard to this whole problem it is quite obvious that the volume of natural gas from the crude area is so large that it constitutes a reserve for this present system and with even the A area and the present gas-cap area of something like a century if utilized as fuel. That is a very important consideration, because I believe the day when you produce wells and waste natural gas in the air has gone. I do not think that is proper. On the other hand, it is, in my opinion, nonsense to shut wells in because of the amount that you are recovering from it. After all, you have got to continue to produce wells. This idea that you are going to shut the gas-cap in and get more oil out of the crude area has not anything behind it at all to justify that idea. To shut the gas-cap in and preserve it as fuel is perfectly sound but we get down to something here that from the crude oil wells will be bound to be produced large quantities of natural gas. The reason I say that this shutting of the gas-cap in does not affect crude oil wells is because the gas-cap is so much lower in pressure. In order to affect the crude wells you would have to raise the pressure in the gas-cap to above that in the crude oil area and the rate of travel is so slow, it took six years for the shutting in of the gas wells in the north end of the field to affect it, and then it only raised it 50 pounds. It is too long a way, therefore, for these wells with only two or three years of life. I feel that what should be done is this, that the gas from a crude well

should be all taken to absorption plants. Absorption plants are the centres around which all this gas is gathered and from there an experiment should be first performed to see whether the gas from the absorption plant can be pumped back into the limestone or cannot be. But it should be tried. That takes possibly $50,000.00 to try it, but if it can be done then the cost at which it can be done can be ascertained. If - and that is a great big if - the money can be found to pay for the equipment and the wells to pump this back in. If it can be shown to be reasonably economical then the gas from the production of the crude wells should be taken to the absorption plant, stripped of its natural gasoline and pumped back into the ground solely as a fuel reserve for the future. I am not saying it will go back in the ground at an economic rate. That I do not know. I do know it is worth trying. Instead of being all upset, my lord, and having operators not knowing what is coming from one week to the next; not knowing the production they are going to have; not knowing what plans you can make, we have got to get down to a basis of settled, orderly development so that when we decide to invest $5,000.00 we know the conditions will remain the same, subject to the variation of production, which we understand. That is our business. When you get half way through you find some order comes in and changes all these conditions and you do not know where you are at. This will take the expenditure of a great deal of money but at once it brings out a sane, careful basis, and gives the executives of the oil companies who are skilled in

their own particular line an opportunity to work out the difficult technical problems. I know that gives you, of course, a complete scheme, if it is feasible. The only way to find out if it is feasible or it is economical is to try it in a small way. Once these figures are available then you can see. And I will give the companies a sufficient length of time to instal this, and it must be done in the Summertime. You cannot make installations of that nature, of that type, in the Winter months.

Q THE CHAIRMAN: It has been tried elsewhere?

A Very successfully. I will go further and say that I have tried it myself on two wells. I have taken a high pressure well and a low pressure well and gas will go back in the formation quite readily. But I do not know the rate at which it will go back. I do not know how much it would cost to put it back because I had a high pressure well which was its own power. But it will go back in the structure. The Highwood No. 1 Well I have tried it. I think it will work out all right, but I cannot make a guess at anything. I would like to see the figures and the experiment actually tried. Above all, it boils down to this, that if you are going to have a century supply of natural gas put there, then somebody should pay for it. That is just as a reasonable business venture. Who pays for it and how much is a matter of considerable difficulty. When you are through with it though you will have all your crude oil and all your natural gasoline. I wish to point out now a great percentage of your natural gasoline is being

burned in the air and that you cannot possibly get the crude oil without the production of the natural gas. If this is a gas field with incidental crude oil production you will see that the volume of the natural gas becomes a very considerable factor.

MR FRAWLEY: Dr. Boatright would now ask some questions.

DR. BOATRIGHT: There have been some points brought out during your testimony that I would like to go over with you. The first one that strikes me is the statement that the oil that will be produced from the Turner Valley field will be merely incidental to the gas. Including your estimate of the amount of oil that will be produced from the two thousand and some hundred acres of proven oil lands, together with the oil that has already been produced as compared with the gasoline and the value of the gas that has been produced, what would be the result?

A I do not know.

Q Approximately how many barrels of oil have already been produced from the field?

A Crude oil? You go so very fast, if you do not mind going slowly with me.

Q Yes, crude oil?

A I am at the close of the day and I am tired, and I think slowly. So I will take my time, if you do not mind.

Q That is all right.

A In the crude oil area there has been produced to date 7,897,082 barrels. That includes Advance 5A and Model Oils. They came in in their earlier history,

they had some discoloured naphtha - it is crude all right - but is discoloured naphtha , or it was called that at that time.

Q You say something over 7 million barrels, and I believe the average price of that oil is about $1.20?

A Somewheres around there, yes.

Q In other words, that would be about in the neighbourhood of eight million dollars worth of oil has already been produced from the crude oil area, is that correct?

A About that, yes.

Q About how many barrels of oil do you estimate still recoverable from that crude oil area?

A Perhaps I can go at it the other way, that the total recoverable crude I estimated from the whole..... do you want any specific area or the whole area?

Q The whole area?

A 3,933 acres - 35,783,314 barrels of which 7,807,082 barrels have been produced.

Q At $1.20 then that would be roughly about thirty million dollars, would it not?

A Yes.

Q What is the value, the average value of gas from the Turner Valley field. That is the average sales value for that gas?

A $7\frac{3}{4}$¢.

Q That is tail gas from the gasoline plant, is it not?

A Yes.

Q And do you have any idea in ratio of the amount of gas which is treated in the gasoline plants and the amount of gas that is used for drilling?

A Wait a minute now. The amount that is used in gascline plants. That is taken to the gasoline plant?

Q That is compared with the amount that is used to drill it?

A Well, practically, the gas used for drilling does go through gasoline plants. For instance, we supply all the drilling wells, mostly all the drilling wells in the south end of the field.

Q I understand that 7-3/4¢ per one thousnnd cubic feet is the price the utilities pay at the discharge of the gasoline plants for gas that is transported to Calgary?

A That is quite right.

Q And I also understand that the price which is charged for drilling the fuel is $10.00 per boiler day?

A That is quite right.

Q Do you have any idea of the amount of gas that is used in one of these drilling wells?

A Yes, very accurately.

Q About how many feet?

A You can take half a million feet on an average, and you are quite safe.

Q That is an average price of about 2¢ a thousand?

A Yes, about 2¢ a thousand.

Q You cannot say that 7-3/44 is the average price of the gas. That is the reason I wanted the proportion. Would you say it averages 4¢? That is a fair average for all the gas that is sold from the field?

A Just let me explain something here. The gas that is sold in the field - and the little group I am associated with, we sell most of that gas, so I have first-hand

figures on that - we sell about, our gas bills right now are running about six million feet a day. Now, the sales to Calgary here on a good cold day would run about sixty million. Our average sales will run about, through the year - I can give you that in short order in detail, if you wish, but I am just giving this from memory, but I would say four million feet a day as compared to an average of twenty-one million feet a day of sales to the plants.

Q That is sales to the Calgary Gas Company system?

A Yes. So if you add those two and multiply ours by 2¢ and multiply twenty-one million by 7¾¢ and divide up the total by 25, you will get the average sales at that price. I am not sure just what you are coming at.

Q Now, what figure would that give, about 5¢?

Q MR. SMITH: Is that 7¾¢ the scrubbed price?

A That is the scrubbed price.

MR. SMITH: You want the field price, don't you?

DR. BOATRIGHT: Yes, I am interestedprimarily in the field price.

A I would say 2¢ a thousand if you asked me.

Q About what percentage of the total amount of gas that has been produced to date has been utilized at all? About 10%?

A Now, again, if you do not go too fast. I think you gave a figure of 971 billion.

Q Approximately 959 billion was the figure I gave?

A 959 billion, and the Calgary Gas Company system uses about six billion feet, and we can go back to 19....

Q 1914. That figure includes clear back to 1914.

A They only came in here in 1921, and there was not very much in 1921. There was not much until 1925. But from 1925 on, that will be thirteen years. If I remember rightly from 1921 up till 1925 it was only a six inch line, is that not right, Mr. McLeod?

MR. McLEOD: Yes. An average of five million a day during that period.

A Five million a day, say one and a half billion, and six billions for thirteen years is 78 billions, and one and a half billion for four is six billions, 84 billion feet.

DR. BOATRIGHT: 84 billion feet. In other words, a figure of 10% of gas used would be very liberal because as a matter of fact after 1924 there was not any of this gas came up from the lime, was there?

A No.

Q So if we use a figure of 10% of the total gas used, giving us about 90 billion feet of gas, with a field average price of 2¢, how would that compare with the value of the oil, as you have estimated it?

A Well, for the purposes of your argument - I do not necessarily have to agree with it - but I will carry it right through to the end. That is 2¢ times 90 billions.

Q Divided by one thousand?

A I do not know whether that is 18 million, or whether it is 1,800,000, but you give me time to work it out.

Q It is $1,800,000.00?

A All right.

Q In other words the value of oil and property, the actual present value of the oil and property as compared with the value of gas and property is in the neighbourhood of $1,800,000.00 - call it two million dollars - in other words the gas has only a value of about 10%, less than 10% of the oil. Even if we assume.....

A We are getting into something I,must want to check. If you leave this gas in there and spread it over the next one hundred years you get a value for the gas that runs into a lot of figures. We have a Conservation Board here which says to leave this gas in the ground. I presume it is for one reason only, or for one reason amongst others, and that is as fuel. We can deal with what took place in the past. The wastage in Turner Valley has been appalling. I agree with that. I agree with all the things you set out on past performance, but like everyone else we have to deal with the situation as we find it now. The situation as we find it now is this gas will remain in the ground for future consumption, and to it must be added whatever recovery you get from the absorption plant.

Q That is true. What is the measure or criterion of an oil or gas field. What would you say would be a fair criterion?

A As to whether your field is an oil field or a gas field?

A Yes, primarily.

Q Well, the amount - I presume you would like me to say dollars and cents.

Q Is that not the true measure of value?

A I doubt it. It is what is produced we are dealing with here.

Q You are dealing primarily with the matter of economics, aren't you? If the value of that gas and oil is such.....

A Well, I will agree with you then. Let us agree with you then.

Q If that is true then this is an oil field and not a gas field?

A I do not agree with that.

Q We agree the value of our oil is about 25 million dollars as compared with $1,800,000.00 for the gas. You agree with the statement that value is a criterion?

A No, I told you I did not follow you. I see what you are coming at. For your purposes I agree with you, but I do not think that settles it.

Q All right, what is it?

A Well, we have here a great big gas field with reserves that are very large and as I think I read a paper by you not three weeks ago, if not by you at least you had something to do with it, on the proper method of handling fields. incidentally one which I thought was very good, and which I agree with. But if this field had been handled properly this gas would not have been blown into the air, and recovery would have been very much higher. Similar in type of production - very dissimilar in type of formation. So you get down to the question that if we had done all these things we would have saved all this gas, and maintained a great deal of this pressure which we have lost and probably recovered a great deal more oil. It would have been the natural gas, the saving of the

natural gas and the maintenance of pressure which would have done it.

Q That brings up a point that might be well clarified here. I understood you to say at one part of your testimony that you could see no reason for closing in a gas well. Was that correct?

A I can see something has to be done about the gas, but but just to shut them in and say "We are through", I do not see that at all.

Q How do you reconcile that with this wish to close the field in, if you cannot shut the wells in, are you in favour of conservation?

A I am in favour of conservation, but my view of conservation is that it starts the day a well comes in.

Q True conservation you are talking of.
If that applies at that time why does it not apply at any other time in the well's life? Just because you start out wrong does not make it necessary to continue?

A You see what I mean, you go too fast.

Q You grant that true conservation then is desirable?

A Yes.

Q That is closing in or controlling gas production from the gas-cap during the early life of the field?

A Now, you are getting into something that I agree with in principle but when you come to something that is ten years too late, Dr.....

Q I am talking of now, - Let us get this one thing at a time, - away at the early life of the field ?

A I agree.

Q Are you in favour then of conservation?

A Positively.

Q You agree than that holding back pressure on the oil horizon is beneficial?

A Clearly.

Q Why is it?

A Because of critical pressures.

Q What is a critical pressure? What do you mean by critical pressure?

A The pressure at which oil and natural gas or portions of - well I will put it differently, hydrocarbon substances which are in liquid form and the natural gas have separate existences.

Q Well, can you take any particular point at which natural gas and oil separate? Is it not a gradual thing?

A It is.

Q Well then, what do you mean by a critical point? Does that take the whole range of pressure from the highest to the lowest?

A With different substances it will be different points.

Q Let us take the Turner Valley Field to be specific?

A You cannot be soecific in Turner Valley, because neither you nor I know the exact hydrocarbons. We know the range they are in, but to get down to the exact amount.....

Q Is the term critical pressure as you use it, is that a word that has been coined by you to describe that particular condition?

A Well I do not know as it is. If you get very techinical about it, Doctor, the critical pressures mean just about that.....

Q I was under the impression that critical pressure was the pressure which, at the critical temperature, just sufficed to condense gas to liquid. That was the one I always heard?

A I do not know as we can agree exactly on that point. What I have reference to is to the exact pressures and I do not know of any better method of explaining them, the temperature being reasonably constant, at which deposition of the hydrocarbons will take place.

Q Well let us apply that idea then. That is an exact pressure, is that right?

A It will be for considering each fraction.

Q Then in this particular field we have a particular fraction?

A We have naphtha area for instance.

Q Is that naphtha a particular fraction?

A No.

Q It is made up of a mixture is it not?

A Quite right.

Q Gas itself is made up of a mixture?

A That is right.

Q About what is that mixture?

A You mean what are they?

Q Yes. About the percentages. What are the constituents of the natural gas that you find here that goes into the natural gas plants?

A I can produce an analysis for you, but I do not remember offhand.

Q Would it be about 88 per cent methane; 6½ per cent ethane; approximately 3½ per cent propane; and about 1½ per

cent butane and about 1 per cent pentane and heavier?

A I should qualify that some by saying it would vary primarily with separator pressures.

Q In other words then, the separator pressures show you there is not any critical pressure?

A That there is not any?

Q Yes, that there is not any exact critical pressure because the very fact that the change of separator pressure changes the condensation that occurs, proves there is no critical pressure doesn't it?

A Oh no.

Q Why doesn't it?

A Well I will have to have time enough to think that one out.

THE CHAIRMAN: Well, we will give you all night to do that.

(At this stage the Hearing was adjourned until 10.30.H. A.M. December 14th, 1938).

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The Province of Alberta

IN THE MATTER OF THE PUBLIC INQUIRIES ACT

—and—

IN THE MATTER OF a Commission, dated the 12th day of October, A.D. 1938, to inquire into matters connected with Petroleum and Petroleum Products

Commissioners:

The Honourable MR. JUSTICE McGILLIVRAY
(*Chairman*)

—and—

L. R. LIPSETT, ESQ.

Session:

CALGARY, Alberta 14th December, 1938.

VOLUME 4

I N D E X

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Wednesday, December 14th, 1938.

MR. FRAWLEY: Mr. Fenerty is here this morning representing Anglo-Canadian Oils and he desires to make a brief statement to the Commission.

MR. FENERTY: Mr. Chairman, and Commissioners, I have been instructed to appear here by the Anglo-Canadian Oils and to ask that an opportunity.....

THE CHAIRMAN: Is that the full name, Anglo-Canadian Oils?

MR. FENERTY: Anglo-Canadian Oils Limited is it not?

MR. FRAWLEY: Yes, Anglo - Canadian Oils Limited I think is the name.

MR. FENERTY: To ask, Mr. Chairman, that an opportunity be afforded that Company of furnishing evidence to the Commission which they think may be of some value in connection with the features being presented and dealt with now, the matter of re-pressuring and the length of life of the field, and I am instructed to advise the Commission the situation is that they are bringing here two recognized authorities on these subjects, but unfortunately they have not been able to permit their attendance heretofore, but they will be here next week. They will have to spend some time making an examination and so forth, but they are anxious to have an opportunity of bringing in the evidence of those authorities before this matter is closed. I understand the Commission is dealing with certain phases separately, and I am simply asking a opportunity to put that evidence in - of re-opening this phase and putting that evidence in, if I can have that indulgence.

THE CHAIRMAN: What does Commission Counsel say?

MR. FRAWLEY: Really, Mr. Chairman, I think I have no alternative but to assert myself that Mr. Fenerty should have this opportunity. I quite realize that there is an aspect of this evidence which does concern and probably I might say alarm people like the Company represented here to-day by Mr. Fenerty. They have now been told by witnesses brought before the Commission and really by myself, because I am Commission Counsel, and at the request of the Royalite Oil Company and they have now read with alarm of the evidence given by these two men with respect to the life of the Turner Valley field. They have large interests there, and I presume they are concerned. I only say that because I feel it is my responsibility to give my accord to Mr. Fenerty, so far as I have any right at all, to furnish this evidence. In other words, if he does desire to bring before this Commission further evidence than I have brought - of course I have brought some myself - but further evidence than I have brought, then I feel that he should be given an opportunity of so doing, even though it might mean not finishing this phase of the Inquiry at this present sitting, or if it does mean we adjourn and leave unfinished this phase of the case. There is this I would like to say. It might mean splitting up the case and then going back to this phase. Mr. Morrison is now ready to proceed, after this evidence of the life of the field is finished, Mr. Morrison is ready to proceed and submit his accounts, and so also is my friend ready to submit his accounts in reply to Mr. Morrison. It is for the Commission to say whether it

would be wise to proceed with Mr. Morrison's evidence while the question of the life is still unsettled, or not unsettled but uncompleted. It is rather difficult and I would like your views about it.

THE CHAIRMAN: Mr. Morrison's evidence is predicated in part upon the length of life of the field.

MR. FRAWLEY: Undoubtedly it is. Frankly I may say, my friend knows it, that Mr. Morrison's evidence is predicated on Dr. Boatright's evidence. He had to prepare his evidence in advance, and that is what we had to prepare the evidence from, and not the evidence we heard yesterday. It is predicated upon the opinions of Dr. Boatright. Dr. Boatright told you that he gave Mr. Morrison the figures, and that is what Mr. Morrison has been using.

THE CHAIRMAN: Mr. Fenerty, your clients have concern with the life of the field. May I take it they are also concerned with the rates that should obtain with respect to this pipeline?

MR. FENERTY: I am not in a position at the moment to answer that. I was instructed just this morning and my instructions dealt with the matter of re-pressuring and the life of the field. As to the implications from that I have not had an opportunity of going into the subject.

THE CHAIRMAN: You do not know whether you will offer evidence of accountants as well?

MR. FENERTY: No, my Lord.

THE CHAIRMAN: Or perhaps to make calculations and offer opinions as to what the proper rates should be, you do not know that?

MR FENERTY: No. I do not know the implications

from it. It was felt when the situation arose we should speak to the Commission at once.

MR. FRAWLEY: Perhaps it would help if I said this, as to whether my friend's client have an interest in the pipeline rates. Say for the sake of argument that the Commission reduced the pipeline rate. It would then be the duty of the Commission to put that lessening of expense either back to the field price or on forward through the refinery, laid down refinery cost, and so on into the fully refined article. I simply point that out as avenues which, I presume, are open to the Commission. So if that went back to the field price my friend, Mr. Fenerty's clients would be interested. I say that merely to assist you in answering that question.

THE CHAIRMAN: Mr. Fenerty, when do you expect your witnesses will be available?

MR. FENERTY: Well Mr. Chairman, the instructions I have are that it will be possible to have the witnesses here some time next week, probably the middle of the week. But it is felt that in order that their evidence be of value, that a somewhat extended examination will be required to supplement that evidence, and if the Commission is sitting after the Christmas vacation - we really have not much hope of being able to tender the evidence until that time. We may be engaged ten days or more on local inquiries.

THE CHAIRMAN: Yes. Will Counsel tell us what their views are as to the recess we should take at Christmas time? That is all apropos of this application.

MR. FRAWLEY: Mr. Chairman, I had hoped to

be able to tell the Commission something about that either publicly or privately, because Mr. Cottle has returned only this morning from Toronto. I have only seen him for less than fifteen minutes. But he will be able to tell me the progress that is being made by the British American and the Imperial Oil Company in the East, and what progress he has made with his work and I hope to obtain from him an idea and then to tell the Commission when we should adjourn too. If we adjourn to finish the pipeline case of course we can just do that ourselves, to very early in January, in fact probably right immediately after the holiday and finish up the pipeline case in January. You can be ready immediately after the New Year.

MR. FENERTY: Oh yes.

THE CHAIRMAN: I think the disposition of this Commission is to dispose of this pipeline matter as a separate matter and not to confuse it, unless Counsel sees some good reason for so doing, not confuse it with other matters in connection with which we have to make inquiries. I think that there can be no doubt, Mr. Fenerty, that your request should be granted. This Commission is concerned with arriving at the truth, and any evidence that will throw light upon this question as to what should be done about the pipeline rates we are happy to receive. But we want to make it clear, however, that we think you should proceed with dispatch, and that the work of this Commission should not be delayed for the convenience of others who could do the work at an earlier date. I leave that, of course, to your judgment, and to your discretion and to your fair

dealing with the Commission to see that your witnesses are available at the earliest possible moment, because in granting your request we are delaying the whole proceedings of the Inquiry as you can understand.

MR. FENERTY: We will use every effort to expedite the preparation of that evidence.

THE CHAIRMAN: When you have further information as to when you can get on you might be good enough to communicate it to Commission Counsel so we may know and lay our plans accordingly. We can speak to the question of the Christmas adjournment at a later date.

Q DR. BOAtright: Mr. Davies, before going into details of the analysis that you submitted, it is my idea that it might be a good idea to clarify the meanings of various terms which have been used; to analyze those terms and to show the various factors which influence their values. In line with that thought we might take up the term gas-oil ratios. I wonder if you would be so kind as to define what gas-oil ratio is?

A Dr. Boatright, with regard to all the terms used in my report and in my evidence, I set out the meaning I intended to convey in writing in the first few pages of my report.

Q I see?

A And be they scientifically correct or scientifically wrong, the meaning I wish to convey to the Commission is, I hope, clearly set out in the written definitions referred to in my report.

Q Possibly you missed my idea in asking that question, which was merely this, to refresh the minds of the

Commission as to what it meant?

A Thank you. Gas-oil ratio, my Lord, and Mr. Commissioner, is the number of cubic feet of natural gas required to produce one barrel of oil. It has been expressed in thousands of cubic feet in this report, which is a gas-oil ratio of 2.1, meaning 2100 cubic feet of gas per barrel of oil.

A May I clear up one answer I gave last night? I was rather tired, Dr. Boatright.

Q We will get to that later.

THE CHAIRMAN: No, I think not. Yes, you may?

A With regard to the definition of what an oil field is and what a gas field is depends upon the amount of money spent to recover so many billion cubic feet of gas or so many barrels of oil, and the criterion is in the amount of profit available from the result of that expenditure of capital. On that basis, taking into account the millions of cubic feet at the prices paid, I agree with Dr. Link that Turner Valley is a gas field with incidental oil production. That being the correct definition.

Q DR. BOATRIGHT: Correct me if I am wrong, but as I understand you, your idea is as to whether or not a field is a gas field or an oil field depends upon the profits which accrue by virtue of the development of the two areas.

A Or which could accrue. In this case we have billions of feet wasted and I do not agree with that or any such waste of that gas. It could have been sold and the expenditure of so much money could have produced so many million dollars. If you were dealing with a new

area for example, that would be the criterion.

Q And at the present time using that definition, would you define this field as a gas field or an oil field?

A I would still define it as a gas field.

Q Let us analyse these figures. What are your estimates of the probable gas reserves yet remaining in the field to be recovered?

A I did not make it.

Q Have you any idea?

A Well I have an idea but I have not got anything to go on except the record. It would be a guess on my part, I really do not know.

Q As a matter of fact the gas area is pretty well defined is it not?

A Oh yes.

Q And it is possible to calculate the original bottom hole pressure at that time, and to calculate or at least make our estimates conservatively is it not?

A Yes.

Q And there is sufficient information available on which to base an estimate of bottom hole pressures is there not?

A I could have done it quite readily but I did not do it. It was not done before the Commission, Dr. Boatright. I can still do it, given time to do it.

Q Well I rather think that this matter is important. Would it be possible for you to do it some time tonight or tomorrow?

A Yes.

Q It seems to ms the definition of the field is rather important as to whether it is a gas field or an oil

field, and of course in order to determine that it is absolutely essential that we have an idea of the amount of gas that is in the field yet to come out, and also an estimate of the oil reserves. I do not see how you can define a field as a gas field at the present time if you do not have information as to the possible amount of gas that still remains?

A Well we have a record of the gas produced, and the amount of money spent in the gas cap. We have a record of the barrels of oil produced and the amount of money spent to secure the oil, and based on the two results the revenue from the gas cap had it been saved and sold, is so very much greter and more profitable that I use that basis as a definition.

Q Just how much more profitable would it have been, even using those figures?

A That very roughly speaking there is one thousand billion feet of gas been produced.

Q One thousand billion feet?

A Up to date, yes, very roughly. The figure you gave, I think was 959,000,000,000 to the end of 1937.

Q That is correct.

A Then you add to that - I have not added this but this is just a rough figure you know - the production during the year 1938 to date. I will give it to you exactly as I work it out, but it is roughly one thousand billion feet has been produced, and the price at which - this answer will have to be qualified by the expense - but the price at which it is sold at the Gas Company's meter station in Turner Valley, is now 7¾ cents. Had it all been sold at 7¾ cents, it amounts to $77,000,000.00. There were roughly 100 wells drilled.

Q 114 was it not?

A 114. I will be glad to accept that figure, but I want to check it in due course, because this I am giving from memory now. The average cost of those wells was something less than $150,000.00 per well.

Q I thought we were taking an average drilling cost of $165,000.00 for the field?

A In the crude area the depths are very much different. I can give instance after instance where wells, some of them are only 3200 feet.

Q In arriving at that figure how many wells did you consider?

A In the $165,000.00?

Q No, in the $150,000.00?

A I took a great number of wells.

Q How many?

A I cannot tell you offhand. I can give you a detailed statement of the expenses of a number of wells. I can give you a number here that I have absolute detailed information on. Highwood Sarcee Number 1 was 5348 feet to the top of the lime, and it cost $133,000.00. The reason I know that figure is that I was required to pu up part of it. Highwood Sarcee Number 2 cost $122,611.00. They are two quite deep wells The latter one was 6780 feet. In due course I can give you the detailed figures.

Q As a matter of fact you gave then the low figures, but there were some that ran over $200,000.00?

A In the early beginning, yes.

Q If we are going to arrive at an actual figure it would be well to have it supported by statistical information?

A Those four figures are absolutely correct, and I will give you in due course a great deal more.

Q On the other hand these two figures are relatively low for that area?

A Well down there there are a lot of other low figures.

Q And there are some a great deal higher?

A Yes.

Q Well let us go ahead with these things. Let us assume your figure of $150,000.00 is right.

Q THE CHAIRMAN: Just before you proceed, as I understand it you want this compilation you asked the witness for, with reference to gas-oil ratios in the field?

DR. BOATRIGHT: Yes.

THE CHAIRMAN: I just want to make sure he prepared it for you, and secondly you want the average cost, I take it of all the wells.

DR. BOATRIGHT: That is correct.

A That is in the gas cap, my Lord?

Q Gas cap and oil?

A And then oil separately?

Q Yes, oil separately.

THE CHAirman: Those you can and will obtain?

A Yes, my Lord. If we take the figure of 114 wells.

Q DR. BOATRIGHT: And you might also check that for your own information?

A Yes.

Q That record was taken from the petroleum and natural gas.....

THE CHAIRMAN: I take it that examination can best be proceeded with when he has the actual figures.

DR. BOATRIGHT: That was my impression. Did you have anything else you wished to clear up at this time before I go ahead with this?

A No, that is all.

Q I believe at the time we stopped with the gas-oil ratios we had defined gas-oil ratio as being the amount of gas expressed in thousands of cubic feet per barrel of oil, am I correct in that statement?

A That is right.

Q I wonder if you would tell us just what happens to the gas-oil ratio of an ordinary oil well from the time the well is started until it is finally abandoned?

A In Turner Valley?

Q Yes, in Turner Valley.

A Will you ask me that question again so I get it absolutely correctly?

Q Would you tell us the history of what gas-oil ratios may be expected in terms of high, low or average during the life of a well in the Turner Valley field?

A I cannot give you that figure and have it mean anything. It will depend on how many wells have already been drilled in or near the neighbourhood of the particular well "A" we might call it, that I might at this moment be considering.

Q Well now, where are the wells principally located that you used in your estimate of area "A"?

A They were located from the minus 1700 foot contour down to the minus 2600 foot contour.

Q In other words, they were chosen from close to the gas cap?

A Within half a mile.

Q And an estimate of those wells would be influenced to a great extent by their nearness to the gas cap wouldn't they?

A I would consider so, yes.

Q As a matter of fact we can - while we cannot give definite figures as to what happens the gas-oil ratios, we can analyse what happens to the gas-oil ratio of a well in comparative terms can't we?

A It always increases.

Q Well does it?

A Yes.

Q When a well is brought in what will be the inherent gas-oil ratio the day the well is brought in, assuming an oil horizon now in which gas is in solution in the oil, and possibly some free gas p above. What will be the gas oil ratio as compared with the gas-oil ratio at a little later period in that well's life.

(Go to Page 335).

A I think I had better read you from the record. In all this evidence in order to give you an opinion that is of any value I have to go back to specific wells and take them all if necessary and take the amount of gas produced in each of the first month, which is the question which I take it you asked me.

Q Yes.

A And then what is the oil-gas ratio in the following month, that is whether the gas-oil ratio in the following month changed, that is the question which you asked me?

Q That is correct, but choose a well in the oil area and analyse it on that basis.

A And you would define the oil area, take Davies No. 2?

Q Area "B".

A Area "B"?

Q Yes, somewhere in area "B".

A Globe Oil, will that be all right?

Q Where is that located.

A It is in area "B".

Q Will you point it out on here on this.

A There (witness pointing to diagram showing wells).

Q All right, in this Globe Well how is that gas measured.

A In the first there was no meter on the well and in the first instance it was estimated by Pitot tube.

Q How accurate is a Pitot tube?

A Not very accurate.

A I think I had better read you from the record. In all this evidence is in order to give you an opinion that is of any value I have to go back to specific ratios and to show if it necessary and take the exact ratio, mapped in each of the first month, which is the question which I read it, as asked.

Q Yes.

A Are there - the oil-gas ratio in the first month, is a right for general ratio in the following month's observed, that is the question which you asked me.

Q That is correct, but whether all in the oil area and analyze it on the 8 cycle.

A And you would define the oil area, what letter is.

Q Area "B".

A Area "B"?

Q Yes, somewhere in area "B".

A Gathe Oil, will this be oil right?

Q Where is that I read.

A It is in area "B".

Q Will you point it out on here on this.

A Here (witness pointing to diagram showing wells).

Q All right, in this Hole Well how is that was made.

A In the first shot was no water on the well, in the first-barrage it was getting in the tube.

Q How accurate is a Pitot tube?

A Not very accurate.

Q In other words it would not be a good well, the measurements would not be very good?

A The measurements would not be very good.

Q Then the gas-oil ratio would not be so good?

A It would not be as accurate.

Q Not as well as where the gas was measured from the beginning to the end?

A Commoil No. 1, we will take that.

Q All that gas was metered?

A I cannot say all the gas was metered but it was certainly metered in the earlier stages of the well.

Q What sort of meter was used?

A Oh I think, I am not just certain, I didn't look at the type, you mean the make of the meter?

Q Yes.

A I didn't look and see the exact make. It was an ordinary, either a Foxborough, although I am not exactly certain, I can find out for you though.

Q Let us take that well then and see what happens to the gas-oil ratio.

A It is a very good well because it is a very large well.

Q What was the gas-oil ratio at the time the well came in?

THE CHAIRMAN: What is this well again?

A Commoil No. 1. The first month is in April, just a minute, October of 1937 in which 5360 barrels required 8250 cubic feet to lift it.

Q 8250 feet?

A Million, 8,250,000 cubic feet.

Q What would that make the gas-oil ratio?

A I just have to figure that all out.

Q Just in the closest thousands?

A It would be one thousand, about 1.1, 1100 cubic feet.

Q All right, what date was that?

A That was on October 1937.

Q Did you have any other gas-oil ratios, what about the last gas-oil ratio?

A Yes, the last gas-oil ratio on that well is 3-point pound something anyway.

Q Anyway it increased?

A Yes, about three times.

Q Then as far as we have gone at the beginning the gas-oil ratio was low?

A Yes.

Q And then as we go on the gas-oil ratio continues to rise?

A That is right.

Q Now of course as we go into the future, in the oil area, the gas, the volume of gas is going to continue to decrease, is it not?

A There is the odd, I am not so sure, that is a point I am not so sure about.

Q I think you will agree with this, in the oil area down near the edge, that eventually all the gas will be gone, you will agree with that?

A Oh I would think so, yes.

Q Approximately what is the amount of the closure which you have between the limit which you have

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

testified is your proven productive area in the gas-cap.

A How many feet?

Q Yes.

A That would be 4500, taking away 1700, is it, 2800 feet?

Q 2800 feet, how many pounds of pressure would that represent if that were an oil column?

A It would be a tenth off, we will take as the specific gravity of .8 if that is satisfactory, 963 pounds.

Q Something over 900 pounds is it not?

A Yes.

Q And I believe on the basis of your statement yesterday you said that when a well, at least you would expect a well to produce down to 300 pounds, didn't you?

A I would think so.

Q All right. Then in the case of that particular well then, we have admitted that the gas will eventually go, and we would still have some oil in there under a hydro-static head or an oil head, would we not, of 960 pounds?

A Well I would like to here, bring in another factor if I may, Dr. Boatright, and that is the fluid level in these wells is a matter which I did not go into in great detail because it is a very conflicting thing, and I do not know whether you have the information on the fluid levels in the wells or not, have you?

Q I have some.

A Well if I might bring up this matter of what the fluid levels, what is happening with the fluid levels in the wells, it can happen and it seems to be in the happening, that the oil is not rising in the wells themselves. It is a very serious matter and I can give you all the evidence which we have. I have it here with me.

Q All right.

A. And that answers your question to the best, in the best way that I know how. This is a list, my Lord, of the exact record of the wells as they take them in the field or their bottom-hole pressures and as they take them they have a record kept of the measurements of the pressure all the way down the hole, at thousand foot, and when they get to the fluid level they measure where the fluid level is in the well and also its temperature so that, it is a private record of the Royalite Company but it is there complete and I will take some of those very deep wells on the west side and read to you the fluid level, together with the depth of the well as production continues, and it would suit your purpose if I read them all in the area "B".

Q Yes, I would prefer to have them in the area "B" because after all that is in the oil area.

A In many of the wells in area "A" there is no fluid level.

Q You would not expect any in a gas well?

A In a gas well?

Q Yes.

A Well we do not normally, but some of these gas wells

produce oil, Dr. Boatright.

Q Then they are oil wells?

A Well I will leave it with you. They are in area A but your partner classifies them as gas wells. The question of Royalite 30, 2660 pounds was its fluid level.

Q Pardon me?

A Was its bottom-hole pressure and I will read this record because it is a very excellent one. The hole is 7690 feet deep and the tubing is set into it, three-inch tubing, at 7656 feet. Now the well was closed in on June 10th for twenty-four hours and the bottom-hole pressure was measured at the end of that period at 2490 pounds. The fluid level was encountered at a depth of 2550 feet from the top of the hole. Now there is one thing I will have to be absolutely clear on, whether that, that is the depth down from the derrick floor measurement. We will just get that, whether it is the derrick floor, I take it is the derrick floor but I will correct it in due course.

Q That would make the fluid level roughly 2500 feet?

A Yes. Now on June 18th it was shut in for a period of eight days, that is from the 10th to the 18th. It was shut in the whole period and the bottom-hole pressure then measured 2660 pounds, that is that factor of the formation pressures equalizing. Incidentally the temperature at the bottom of the hole was 154 degrees fahrenheit. At the end of

that period the fluid level was 1850 feet from the top of the hole. Now the well was produced until July 28th.

Q Pardon me, are those all in the same year, that June 18th and July 28th?

A All in 1938.

Q I see.

A Produced then until July 28th roughly, the bottom-hole pressure was again measured, shut in twenty-six hours and measured 2505 pounds, and the fluid level at this stage is 2725 feet from the top of the hole. That is in other words it has gone down 900 and something feet. On August 26th the bottom-hole pressure was measured at 2220 pounds. You will note a very rapid drop in these bottom-hole pressures, my Lord. Shut in for twenty-four and a half hours, that is a drop of 285 pounds in two days under one month and at this time the fluid level is 3950 feet from the bottom of the hole, from the top of the hole, pardon me. Now there is one more measurement, in November, which I have not got on the sheet.

Q But those are all the measurements which you have on that particular well?

A There is one more in November.

Q Which you do not have?

A I have not the complete record. I have the measurement of the pressure but I have not the whole record here.

Q Let us analyse those figures then. Roughly the fluid level in that particular well was 5000 feet, what was

the exact figure, on June 10th?

A 5140.

Q And on July 18th, by the way what was the bottom-hole pressure at that time?

A On June 10th, it was 2490.

Q And the bottom-hole pressure on July 18th was what?

A 2660, July 18th or June 18th.

Q June 18th.

A There are two pressures one on June 10th of 2490, and then it was shut in the whole eight days and then----

Q That is the one I want.

A You want the 2660.

Q That is right.

A Just a minute, on June 18th after being shut in eight days there was 5840 feet of fluid in the hole and the bottom-hole pressure was 2660 pounds.

Q Now let us analyse those two figures. As I understand you the difference in pressure was that between 2660 and 2490 or approximately 170 pounds, that was the difference in the bottom-hole pressure, was it not?

A That is right.

Q And the difference in fluid level, was that represented by the difference between 5840 under the high pressure and 5173 under the lower, is that correct?

A That last question again, I missed it, the difference in pressure.

Q No, the difference in fluid level.

A Oh yes.

Q That was represented by 5840 feet of fluid in the hole under the 2660 pounds?

A That is right.

Q And 5173 feet of fluid in the hole, is that figure correct?

A 5140 feet.

Q 5140 feet, I am sorry.

A That is correct.

Q In other words there was about a 700 foot difference in the fluid level on those two dates?

A That is right.

Q And the difference in bottom-hole pressure was 170 pounds, was it not?

A That is right.

Q And about how many feet of oil is represented by a pound of pressure?

A Again I will have to figure this out, just one minute.

Q Certainly.

A One fo t vertically, if I have done this correctly 3.5 pounds, 35 pounds to the hundred feet. Take 43.4 pounds of water and oil at the specific gravity of .8, it works out at, that is right, 3.4 pounds, say 3.5 pounds will be near enough.

Q In any event then if we divide that 600 feet, which represents the difference in fluid level.

A 700 feet.

Q Yes, 700 feet.

A By 3.5.

[illegible]

A Ok yes.

[illegible] to weep on a field in the

[illegible] properly

A [illegible]

[illegible] and dry. [illegible] that figure

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] in other [illegible] was a fin [illegible]

in the [illegible] in question.

A Then [illegible]

[illegible] And [illegible] bottom-side [illegible] was in

[illegible]

A [illegible]

[illegible]

[illegible] And [illegible] in proportion by a

power [illegible]

[illegible]

A And [illegible] figure [illegible], but are

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] Of [illegible], if I have [illegible] in proportion

[illegible] the [illegible] a foot. He

[illegible] a [illegible] of water and oil as it [illegible]

[illegible] it [illegible] out it, that [illegible]

[illegible] will be [illegible]

[illegible] then [illegible] distance [illegible]

proportion [illegible] in fluids.

A [illegible]

[illegible]

[illegible]

Q Yes.

A It would be 200.

Q It gives us 200, does it not?

A Yes.

Q In other words we would expect under that fluid level to have a pressure increase of about 200 pounds, would we not?

A That is right.

Q Now you are familiar with the pressure gauges that they use?

A Yes.

Q What would you say there accuracy is?

A Oh---

Q Well let us let that go, but if it was within thirty pounds you would think that was satisfactory?

A Correct.

Q You would say for all practical purposes that was satisfactory?

A That is right.

Q Therefore the fluid level is exactly what you would expect?

A That is right.

Q Take the next two now and do the same thing.

A I will read the July 18th, that figure should be July 28th. My figure is not very good on that, not July 18th, but July 28th, the bottom-hole pressure was 2505 pounds, the fluid level was 2725 feet. If I subtract 1850 from 2725 I get 875 feet. Multiplying by 3.5 gives 306 pounds and the pressure drop was 155.

Q You multiplied 875 by 35?

Q Men.

A It would be [illegible].

Q If given an 800, does it [illegible]?

A Yes.

Q In other words, we should expect that fluid [illegible] or have a pressure increase [illegible] would be [illegible]

A [illegible] the right.

Q [illegible] you are familiar with the pressure [illegible] that [illegible].

A [illegible].

Q [illegible] you [illegible] conservative?

A [illegible]

Q Well [illegible], but if it was [illegible] pressure [illegible] would [illegible] that was satisfactory?

A [illegible].

[illegible] for all practical purposes [illegible] satisfactory.

A [illegible].

Q If [illegible] fluid level to [illegible] you would [illegible]?

A [illegible]

Q Take the next two [illegible] and [illegible] the same [illegible].

A I will read the July 18th, that figure should be July 18th. [illegible] not very good [illegible], not July 18th, [illegible] a [illegible] an [illegible] level [illegible].

It's a [illegible] from [illegible] I [illegible].

Multiplying by [illegible] gives 30[illegible] pounds [illegible] the [illegible]

A By 3.5.

Q Why did you do that?

A Is that not what you asked me to do, to do the same as I did in the previous one?

Q Yes I asked you to do the same as you did in the previous one, but you divided it, did you not?

A Did I divide it? that is right I did, 230 is that correct?

Q In other words it is about 70 pounds difference there?

A Yes.

Q But you notice that in that difference this one well was shut in from July 28th, the well was shut in for eight days, was it not?

A On July 18th, that was the end of the eight day period, June 18th.

Q And in this particular case it was shut in for twenty-four and a half hours, is that correct.

A Twenty-six hours.

Q All right then, with that 75 pound difference that might be accounted for by the gauge itself, might it not, in errors in reading the gauge?

A There can be errors there both ways.

Q Then as far as this particular well is concerned the fluid levels are practically the same and we have not considered the theoretical aspect of fluid levels, have we?

A No.

Q Let us do that, let us suppose we have a box in which there is gas and oil under pressure and we drill a well into that box and we have tubing in

that well and we produce that well, what are the conditions in the well when you are producing?

A I just open it wide open, or do I have---

Q Open it up under control so that you have normal flow which would be continuous, would you have not an ordinary oil well?

A Let me see if I have got that right, you have a box and you have oil and gas in it?

Q And there is sand in there so that you get something like the characteristics of an oil well?

A Is this gas in the top?

Q Gas in the top and there is also some gas in the solution of the oil.

A That would predicate it is under pressure.

Q Under pressure.practically to this.

A 2600 pounds?

Q Yes, and you drill a well.

A You put a tube in it and you start to produce.

Q Yes.

A And this is a perfect sand?

Q Yes.

A We do not have to consider porosity or anything like that.

Q We consider perfect conditions all the way through.

A I would say the first, we start off with the top of the hole closed?

Q Yes.

A Then the first start is to open the valve at the top of the well.

Q Right there brings in an interesting point, just when we crack that valve at the top what will be the

[illegible] I am we [illegible] work, what are the [illegible] [illegible] when you are producing [illegible] I have seen it with [illegible], or on I have---

Q (or it up and [illegible] I [illegible] [illegible] flow which we [illegible], would you [illegible] not [illegible] [illegible]

A [illegible]

[illegible]

A [illegible]

[illegible]

A [illegible]

Q [illegible] [illegible] in the [illegible]

[illegible]

A [illegible] measure.

Q [illegible]

A [illegible]

Q Yes, [illegible]

A You put a tube in [illegible] to produce.

Q Yes.

A [illegible] this is a [illegible] [illegible].

Q [illegible].

A [illegible] possibility or [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Q Yes.

A [illegible]

[illegible]

[illegible] [illegible] [illegible] [illegible], [illegible]

when [illegible] [illegible] [illegible]

gas-oil ratio?

A Well I would think the gas-oil ratio would be almost completely gas.

Q It would be almost infinitesimal?

A Yes.

Q And as you open up what happens to the gas-oil ratio?

A It drops.

Q And as you continue to do that beyond a certain point, what happens to the gas-oil ratio?

A Well presently oil begins to come.

Q That is right, and if you continued to open that well up the gas starts to move there so fast that the gas then starts up----

A That is right.

Q Then the gas-oil ratio curve has a reversed graph depending on the condition upon which the well would produce.

A Very much so.

Q How about these wells in the field, are they all producing under the same conditions?

A No, no.

Q Are they all, have any of them been produced under the same condition throughout their life?

A Yes.

Q Which wells?

A I would say Sarcee No. 1. It is in the gas-cap. I know about that one.

A Yes.

Q And that the gas-oil ratio is a function of how that well is being produced when it is taken?

A Yes, it is true in part, Dr. Boatright.

Q What do you mean?

A All these conditions reflect each well over the whole field, the average gas-oil ratio, for all the reasons which you have enumerated and perhaps others which I have not time enough now to think them out. They cause the gas-oil ratios to rise.

Q But nevertheless at any particular time when you go out to take the gas-oil ratio it is a function of the way the well happens to be producing at that time?

A Yes, I think that is true.

Q Now then in making your estimate you took the gas-oil ratios that were made at a particular time in that well's history, at the time the commission's man went out there and took it?

A No.

THE CHAIRMAN: Do you mean to go that far, produced at that time, had you not previously said each amount must be taken as to the well's production and so on?

A That is quite right, my Lord and the condition he enumerated, if I might have that question of the points he raised in the question.

Q I do not care what the witness's view is, I wanted to be sure I had it.

DR. BOATRIGHT: I appreciate that.

(Reporter Reading:)"Q. In other words you know generally throughout the field the gas-oil ratios have varied from day to day depending upon the way the well has produced together with the offset and other conditions?"

THE CHAIRMAN: The question is quite broad enough to cover what I had in mind.

Q DR. BOATRIGHT: Now let us clear this question up a little more, it brings up a very interesting point I think, and that is at any given well with any given off-set conditions I do not care what they are, we will say those off-set conditions are stated and we go to a particular well and we can go through this same procedure which we have just discussed, that is opening the valve very slowly, having an initial gas-oil ratio, opening it slowly until the gas-oil ratio eventually keeps decreasing until we reach the point in the formation at which the gas starts leaving the oil back in the formation and then the gas-oil ratio starts up again.

A Yes.

Q Therefore the gas-oil ratio in a particular well under a given set of conditions will vary from day to day and hour to hour, depending upon the amount of oil which is being produced, the real displacement out of that reservoir, will it not?

A- Yes, it will.

Q- If we add the additional possible factors of the off-setting wells operating from time to time ,and assuming as you say that they affect it to a certain extent don't they?

A Yes.

Q Then if you do not know the off-set conditions and you do not know the conditions under which this well was producing at the particular time the gas-oil ratio was taken, you do not know anything about the actual sub-surface conditions do you?

A That is purely a theoretical question.

Q Well, is not that reasonable?

A It probably is. But you remember that these wells are not going from these extremes to this extreme in that rapid manner from day to day.

Q Don't you have gas-oil ratios ranging from 20,000 feet per barrel, or from 695 feet per barrel to over 300,000 feet per barrel?

A Yes.

Q And don't you have in the records of your wells where you have differences of over 100,000 cubic feet gas-oil ratios on the wells you took in your estimate?

A Not 100,000.

Q Let us go back over some of these records?

A 100,000 you said?

Q 100,000 yes?

A We have Miracle is the highest one.

Q And what gas-oiloratio change did you get there?

A Miracle Number 2 was 121,000 feet per barrel. Its

average there would be 8 prior to that.

A Miracle 2? I do not think it ever had as low a gas ratio as 8. It would be more like 80.

Q All right. You had a gas-oil ratio, an average gas-oil ratio for that whole period at 84.4. You would then have a fifty per cent increase in the gas-oil ratio in that particular well. We are taking this from the time the well came in in 1933 clear up to 1938?

A Just wait a minute till I get that in here. Miracle Number 2, that was the oil-gas ratio made throughout....

Q We are referring to statement Number 4?

A Yes. The average gas-oil ratio over the whole lifetime of that well was 84.8, and I used the greater figure. Let us get clear what I did use. In no single instance have I used any particular daily measurement, or any measurement made any one day. It is the average over the month.

Q All right. The subject we are talking about now is whether or not there has been an appreciable variation in gas-oil ratios in wells which you considered. Is that not the question?

A It is. There was, but not to the extent of 100,000 cubic feet. We can take it, the actual record is here in every instance.

Q All right, let us look at it.

A In no instance have I given you any figures without the facts right all the way through.

Q There was no question of that. But I am trying to draw conclusions from these figures. We should number these pages.

THE CHAIRMAN: Yes, I think we had better have

these pages numbered from the beginning to the end.

Q As a matter of fact referring to your statement of bringing in Miracle Number 2 in September 1933, during that month they produced 608 barrels of oil with 45,000 cubic feet of gas?

A 45,000,000 that will be, all M.C.F's.

Q 45,000,000?

A Yes.

Q If we divide 45,000,000 by 608 barrels what do we get?

A 74,000. Is that not right?

Q That is approximately correct. Let us drop down to December 1934, and you have there 255,000,000 divided by 3000 barrels, or approximately eighty, don't you?

A Eighty?

Q Eighty?

A Approximately eighty, yes.

Q In other words, these gas-oil ratios usually gradually increase as you thought they would don't they?

A That one does, I explained about special cases in my evidence of two wells, which is this and the Advance, and we have some graphs showing in special cases where the gas-oil ratios do the opposite, if you would like to carry this a little further.

Q You do not agree with the idea that the gas-oil ratio is a function of the rate at which the well has produced?

A Oh I do. I add to that bottom hole pressure. The records of the bottom hole pressure at a given time and the rate at which the well has produced will determine your gas-oil ratio. In general, the gas-oil ratiosin Turner Valley, and I speak specifically with regard to

Turner Valley, are related to their bottom hole pressure.

Q At a given rate of flow?

A At a given rate of flow. To answer that I would have to see the wells operating at several different rates of flow. Although the record of the amount produced and the rate of flow is reasonably constant in each month, it might change within the month

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Q Mr. Davies, I believe that we were discussing various phases of gas-oil ratios and I believe just before we stopped that we were discussing the effect of rate of production upon the gas-oil ratio?

A Yes.

Q I believe you agreed that if we take an oil well which also contains some gas and crack the valve at the top that the gas-oil ratio would be almost infinitesimal?

A Correct.

Q And as we open that valve what happens to the bottom-hole pressure?

A It begins to drop.

Q And what happens to the gas-oil ratio?

A It begins to drop.

Q Am I correct in saying that that goes on to a certain point at which the minimum gas-oil ratio is obtained?

A That is correct.

Q And then if we exceed that displacement in the reservoir the gas-oil ratio begins to rise?

A Yes.

Q That would be true of any well, will it not, regardless of the offset?

A Yes.

Q Do you agree with that?

A Generally speaking, yes.

Q Can you think of any exception?

A We have a peculiar circumstance in Turner Valley where it is true on Advance 5A right now, where by opening the well you get a lower gas-oil ratio. If this process went on and the gas-oil ratio was increasing, I would

correct that there, the gas-oil ratio, I mentally twist those two words, my lord, gas comes first, the gas-oil ratio, greatly increases, and when it reached, they reach certain pressures, then we have the peculiar circumstance of when you open the well to flow wide then the gas-oil ratio decreased.

Q There is this about that particular well though, that is not either a gas well or a true oil well, is it?

A Well, it produces both oil and natural gas.

Q It originally started out as a gas well?

A I can give you, perhaps, two or three more examples.

Q Let us clear up this one first, that particular well was primarily a gas well, am I correct?

A I think so.

Q And then showed traces of oil as the pressures declined?

A And then went into a crude well.

Q And we will just analyze what happens in that particular well then, in line with the other gas-oil ratio work, as we open up that well, we have almost an infinitesimal gas-oil ratio regardless, do we not, as we just crack the valve on the surface?

A Yes, just momentarily.

Q You get nothing but gas?

A Momentarily.

Q And that gas contains only the amount of gasoline and naphtha which is inherent in the gas?

A That would be correct.

Q Then as we keep opening the valve what happens to the gas-oil ratio ?

A It begins to make oil, and the pressure goes down.

Q The pressure goes down?

A Yes.

Q Then we finally reach the point where the gas-oil ratio starts up?

A Yes.

Q If we continue to open up that well, what happens to the gas-oil ratio?

A Then there are the odd few wells in Turner Valley that reverse it.

Q Does this well reverse it?

A Yes.

Q In other words, is there not a logical reason for that?

A I am just stating the fact.

Q Would you say this in that particular well, it is connected rather closely with the oil horizon and when you first start producing the well and get this ordinary gas-oil ratio which is expected, then so far as the immediate vicinity of that well is concerned you will get the true reaction, but if you increase the amount of taking out of that well or the displacement from the ground, then you create an artificial low pressure area immediately around that well and allow oil to migrate in from the oil part of the formation, into that well, which gives us the so-called phenomena you are talking about?

A I find it difficult to put together the two phases of creating this low-pressure area and then having oil left back in the formation and then at the same time getting some oil out and having the oil collect around the bottom of it. I am not in a position to explain what exactly has taken place. I am in a position to state the facts that have taken place.

Q Well, in any event then, in that particular well, we get the normal gas-oil ratio reaction up to a certain amount?

A That is right.

Q And you will admit even possibly beyond that point? Some other factors enter into it beyond an ordinary well?

A Yes.

Q Between the gas and the oil zone?

A That is something I cannot determine.

Q Now, in your estimate you took the area A, I believe.....

THE CHAIRMAN: Dr. Boatright, do you mind pursuing the enquiry as to this, what bearing, if any, has the rate of withdrawal, the rate of production in off-set wells, upon what the witness has just said.

DR. BOATRIGHT: All right, I will be glad to do that.

Q DR. BOATRIGHT: Carry on then, our gas-oil ratio work. If this particular thing happens in one well it will probably happen in the rest of the wells, will it not, that is the change of gas-oil ratio, with different rates of production and what is the relationship between the gas-oil ratio and the bottom-hole pressure?

A Now, I shall go, return again to the record of the performance of the well. In the months of August and September, 1938, the rate of withdrawal was set at 28,300 barrels. In order to produce that it is necessary to open these valves at the top of the well, but the effect of that again was to lower the pressure in the formation at the bottom of the well.

Q Pardon right there, what happened to the gas-oil ratio?

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A It rose. The gas-oil ratio rose. Now, whether the rise in the gas-oil ratio is due to the rate at which production was taken out or to the decline in that bottom-hole pressure is a point that they are associated together, and I do not know how much weight to put on each one. The rate of withdrawal affects the amount of bottom-hole pressure decline and as a result of bottom-hole pressure decline you get a rise in the gas-oil ratio.

Q Let us analyze that?

A May I finish my answer?

Q Excuse me?

A In the months of October and November the rate of withdrawal was lessened down to 11,500 barrels a day and then 12,500 barrels a day. The effect of that lowering of the rate of withdrawal has meant a rise in the bottom-hole pressures and a decrease, and here is the important point, that the gas-oil ratios did not go back to completely the rate at which those gas-oil ratios were previous to the time that this steady drop in pressures took place. There was a permanent damage done to that well, in other words, and it affects the point of the amount of gas left in the formation to push oil into the bottom of that hole. Now, I can only give you the exact record and that is the basis for the answer I gave you.

Q A record without its proper interpretation is of no value, is that not correct?

A Oh, I do not agree with that at all, Dr. Boatright. To me all the interpretation and all the guesses in the

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world are worth nothing without the record at all. I must have the record. I must have the facts to support that.

Q You have the actual production that occurred from that total reservoir?

A Of total barrels of oil?

Q That you estimate would be produced, did you have the actual record of that?

A That would be produced?

Q Yes?

A Oh, no, I based that on the record of what had been produced, but I have that.

Q And in doing that you interpreted these records, didn't you?

A Of course, from the actual performance and I stated it was a guess.

Q In other words, it is necessary then to have an understanding of what these records mean, is it not?

A I agree with that, yes.

Q Well, that is a point then, let us analyze these bottom-hole pressures, what is a pressure, by the way, what causes pressure?

A A desire for, perhaps I had better read it, to be consistent, bottom-hole pressures?

Q No, what is pressure, I do not believe you discussed pressure alone, I think you talked about bottom-hole pressure, what is pressure itself?

A I do not know whether I defined pressure itself. It is I do not think I have it in an exact definition. It is the bombardment of the molecules of any substance

against the walls of a container, usually measured in pounds to the square inch in oil field work.

Q Converting that theoretical thing then in terms of fluid heads, what does that mean?

A We will take water, for example.

Q That will be fine.

A It will be the bombardment at, we will say, 5,000 feet, I will take one that is easier to calculate, we will say 1,000 feet. The molecules, I will give you a little illustration of this, my lord, with your permission, we put a bomb, just a little container, down to 1,000 feet and there is a little plunger, mind you, all sides of this container can be bombarded by the weight superimposed of 1,000 feet of water upon successive layers of molecules, and this bombardment presses this little piston to a point where we can read it, either of the gravity or in a pressure-guage, and we read 434 pounds, because the weight of 1,000 feet of water per square inch amounts to the amount of 434 pounds,; in other words, one cubic foot of water weighs $62\frac{1}{4}$ pounds, $62\frac{1}{2}$ pounds.

Q 62.4?

A 62.4, is it?

Q Yes?

A And by superimposing the weight of one foot, until we get 1,000 feet on each square inch , we get a pressure of 434 pounds.

Q That means to say that the column of water 1,000 feet in height and a square inch in cross-sectional area is 1,000 pounds,is it not, or weighs 434 pounds, I mean?

A That is correct, quite correct..

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Q Now, in this little container you are talking about, how about the pressure on each square inch of surface in that, is it equal or does it change at the top or bottom, or what about it?

A This, we had oil in the bottom, did we not....

Q No, your container was water?

A Oh, this column of liquid, will you say that again?

Q Is the pressure on each square inch of surface the same throughout?

A At that level, yes.

Q In other words, the contained liquid then exercises an equal pressure in all directions?

A That is a physical law.

Q And if we take that liquid that is in that container under that pressure, that container is exerting the same pressure inward as the container is exerting outward?

A That is correct.

Q Now, what is the only way in which we can, I will put it this way, in what way can we use to reduce the pressure in that container?

A Well, we can make the container smaller.

Q We have the liquid in there? It is under a certain pressure?

A That is right.

Q Now, what can we do to lower that pressure in the container of that confined liquid, if the container stays the same size?

A We can begin to take the liquid off the top.

Q That is right, and what happens to the pressure in there in proportion to the amount of liquid taken out?

A It is lowered.

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Q In other words, the displacement of that solution is what lowers the pressure in that particular case?

A That is right.

Q Jumping from that container then to the reservoir, what is the difference between an oil reservoir and that container, insofar as the liquids which are in there are concerned?

A This reservoir being all full of holes, complete holes, there is no difference.

Q All right then, how is the only way that we can reduce that pressure on that reservoir?

A By opening the valve at the top of the well. You are referring to an oil well now?

Q Drilling a well, in other words?

A Yes.

Q And that pressure in the formation is going to go down in proportion to the amount of fluid, gas and oil which is taken out of that?

A Yes.

Q And it will go down in proportion to the actual amount of gas and oil which is taken out of that reservoir?

A I would think so, yes, and the proportions, the various proportions, there is a lot to that, but I think that is absolutely right, what you have said, but it may be qualified.

Q You agree with that supposition?

A Generally, yes.

Q Now, we come to this point about the bottom-hole pressure changing with the gas-oil ratio, is it the withdrawal

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from the reservoir that causes that pressure drop, the actual displacement of gas and oil that comes out of that well that causes the pressure drop?

A Yes.

Q Therefore, that pressure drop that occurs in that well occurs because of the amount of gas and oil displacement that has taken place in that immediate vicinity, is it not?

A Yes, that is right.

Q Therefore, the bottom-hole pressure is a function of the gas-oil ratio, is it not?

A Just right there we will, you see it is getting into something that is theoretical, and I want to state here that when you drop this bottom-hole pressure in the wells in Turner Valley the proportions of gas to oil were, as we will say two to one, that is during the period when the drop took place, Now, these proportions are constantly changing, and the change in these proportions is that represented by the increase in the amount of gas per barrel of oil, and as the bottom-hole pressure drops we do not go back, if we raise, if we stop the rate of withdrawal, we do not go back to the same proportions as when we started that rate of decline.

Q What causes that bottom-hole pressure to drop?

A It is the withdrawal.

Q In this container which you are talking about?

A It is the withdrawal, the amount withdrawn.

Q In other words, if there has been a certain amount of fluid withdrawn from there it means that the bottom-hole pressure is going to be reduced to an amount equivalent to the displacement that has occurred in that particular area, is it not?

A Yes, that is true, but there are other things in there.

Q What other things?

A Well, the formation is not just a perfect container in the first place, and you get back in, down in the bottom of the hole, and two feet away from it, or a foot away from the bottom of the hole you have this expansion taking place, and you measure the bottom-hole pressure right at the bottom of the hole. Now, a foot back in the formation the pressure is a little higher, two feet back in the formation it is still a little higher, this is an irregular sort of thing in Turner Valley. In one place it may be 10 feet and in another direction it may only be 10 inches, so that we have gas and oil and gas in oil, as it were, pushing towards this lower pressure area. Now, it is true that it was the withdrawal of the two substances that caused the drop in the bottom-hole pressure, but then the effect of that withdrawal in creating an increase in gas-oil ratios is dependent upon the factors of how that gas left the oil, whether it left it too fast or whether it accumulated around it.

Q You mean the production rate?

A The production rate, and I cannot fairly answer that question without explaining my answer, my lord.

Q All right, then, this container is stated to be the drainage area of that well?

A Yes.

Q And for any given period it is going to be more or less constant, is it not, providing no other wells are drilled?

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A Oh, yes, if there is no off-set well. Now, just a minute, it is my opinion based on Advance 5A and Miracle 2, that the first day the well comes in the drainage area is relatively small, the first day. The second day it is a little wider and so on.

Q How about the rate at which that drainage area goes out further though?

A Very slowly.

Q And the further you get from the well the slower it gets, is it not?

A I think that would follow the differential in pressure, I think that is right.

Q As a matter of fact, comparatively that pressure starts out in radiating circles the moment you opon the well up?

A Yes.

Q How abo t the variation in pressure as the circles radiate out from the well?

A The pressure decreases between each one, that is the point you are raising?

Q Yes?

A I do not really know.

Q I think we can analyze it. How about the circumferential distance around these circles, if one circle is twice the radius of the other?

A How much area, you mean?

Q Just proportionately?

A I will have to figure that out.

Q Do that, will you?

THE CHAIRMAN: You might do that during the lunch time.

(The Investigation here adjourned and was resumed at 2:00 p. m.)

.....

Wednesday, December 14th, 1938.
P.M. Session.

Q DR. BOATRIGHT: I believe, Mr. Davies, we were discussing the displacement in the reservoir and its effect on bottom hole pressures at the time we adjourned this morning, and I believe we had gotten to the point where we were considering the reservoir and the effect of gas and oil production which results in the removal of a certain amount of contained fluid from the reservoir, and the incidental results in the drop of bottom hole pressure, and in pursuing that line of thought we had gotten to the point of whether or not we could consider the so-called drainage area around a well as a container of constant volume or not. In pursuing that line of inquiry we had arrived at a point where we considering the relation between circumferential distances around two circles, one of whose radius was twice the other, in terms of proportion and you were going to calculate that proportion. Have you done so?

A I was not quite clear whether you meant the area in between the two circles or the length of the circumference. They vary as their diameter. Or if it was the distance around the area or in between. That is what I was not clear about.

2 P.M. SESSION

Q We had arrived, I believe at the point where the areas varied with the square of the diameter as we go out from the well bore, is that correct?

A I think so, that will be correct anyway.

Q Now if we consider the drainage area of the well to be the average well spacing in the field, which I believe your figures show as 46½ acres?

A That is correct.

Q And our figure show as 36 acres? That area represented in comparison to the amount of withdrawal in any period such as a month would indicate an almost infinitesimal small movement at the edge of that drainage area, would it not.

Might I interject here this, that in the event that you feel that that is not a minor thing, we can, of course, go into these displacement figures, but I thought if you were satisfied to make that admission without going into those figures it might save us some time?

A Well I don't know.

Q Perhaps then it would be better to figure what these displacements are, what would you say is approximately the average number of barrels of oil produced by a well in a month from your area "B"?

A I would have to sit down and figure it out.

Q You do not have the figures available for that?

A No, you see it varies with the pro-ration figures, I can give you the monthly figures from each of these wells.

Q Well, do you have the monthly figure for one well?

A Oh yes, I have the complete total.

Q Let us have it.

A For each well, Royal Canadian Number 1.

Q Where is that located?

A It is in area "B".

Q This is the well right here?

A Yes.

Q And that spacing would be approximately a forty acre spacing?

A Yes, that is the reason, one reason.....

Q How many barrels of oil did that well produce during some months?

A During any one month?

Q Yes, just pick some month that will suit you?

A Well, I will just read you the monthly record and then you can tell me, any month.....

Q Just pick a month?

A Oh take June, I will get one near an even figure.

Q That will be all right?

A May is 15,600.

Q THE CHAIRMAN: Can you tell us what page you are on?

A Page 38.

Q DR. BOATRIGHT: Yes, if I understand you correctly then, in June the Royal Canadian Number 1 produced 15,600 barrels of oil?

A The month of May.

Q And how many cubic feet of gas?

A 16,694,000.

Q For the purposes of this illustration let us just take the nearest whole number, disregarding the fraction, that will make it then 15,000 barrels of oil and 16,000,000 cubic feet of gas?

A Yes.

Q During that time. What was the approximate bottom hole pressure in the area surrounding that well? Do you have that?

A Yes, I just wanted to see because we can select a month in which I have the measurements and I am not sure of the month of May, this will be page 47, my Lord, Statement Number 2, Royal Canadian Number 1, February, the Month of May, 1655 pounds.

Q That would represent than fairly the average bottom hole pressure during that month, you would think?

A Yes. I gave in my testimony or evidence that it was a twenty-four hour basis.

Q Yes, I realize that?

A Yes.

Q I just wanted to get this figure, to point out to the Commissioners the amount of movement which would occur out on the edge of that forty acre rim?

A May, that is right, 1655.

Q How many atmospheres of pressure would that be?

A 163.

Q Using the figure 15?

A 110 I think.

Q Pardon me, Mr. Chairman, would you like an explanation of what we mean by atmospheric pressure or what we mean by "atmospheres"?

THE CHAIRMAN: It might be well.

Q Would you define "atmosphere"?

A The pressure at sea level of the weight of the atmosphere, and the atmosphere is a column of air taken infinitively high, which weighs on one square inch

14.4 pounds.

Q Just a slight correction there, it is 7760 millimetres of mercury, which is equivalent to 14.69 plus pounds per square inch?

A That is quite correct, my Lord.

Q The figure 14.4 is taken for what reason?

A In here we use 13, in Turner Valley, I am not quite clear why you took 14.4 myself, because we do not use 14.4 here. We use 13 in such things like our meter readings and so on.

Q The reason I used 14.4 is because that is the pressure base on which all gas measurements of the Petroleum and Natural Gas Division of this Province, that is what they use in all their gas calculations, and it so happens that that 14.4 is the average atmospheric pressure in the Mid-Continent area in the United States, and because of the fact that the gas industry more or less started there, that is the generally used atmospheric pressure, that is where that figure 14.4 comes from. However, in order to simplify our figures we will not bother with the appreciable distance, but will use the figure 15 pounds; using that figure 15 pounds then how many atmospheres of pressure does this 1655 pounds represent?

A 110.

Q 110, will you explain to the Commissioners what that means in terms of gas volume, in other words, how much space will 16,000,000 cubic feet of gas, referring to our standard conditions at the surface, actually occupy under a pressure of 1655 pounds?

A We are dealing with pure gas, as a pure theoretical

problem it would occupy 1/110th of 16,000,000 down underneath, of pressure. If it is at the bottom of the ground, this is pure theory.

Q Why is that?

A It is Boyle's Law, physical law. It has been experimentally developed. There is a variation, you do not want anything like that?

Q Yes.

A At very high pressures there is a slight variation, but it is an ordinary law of physics.

Q In other words, that means that at a pressure of 1655 pounds, 16,000,000 cubic feet of gas measured under atmospheric pressure at the surface would actually occupy 1/110th part of 16,000,000 cubic feet, is that right?

A That is right.

Q Now if we divide 16,000,000 cubic feet by 110, the resultant figure will then represent the actual space in cubic feet which that gas occupied in the formation will it not?

A Dealing now with a purely theoretical.....

Q Perfect gas?

A Yes. Do you want me to do that roughly.

Q If you will!

A I think I am correct, 14,544. I may have to multiply this again. I multiplied it by 100, that is not right either. If I have to do these things too slowly, my Lord.....

Q THE CHAIRMAN: It is quite all right.

A 16,000,000, was the figure was it not?

Q Yes?

A So that will be 145,000.

Q Now how many barrels, how many cubic feet are there in a barrel?

A One barrel is 35 gallons, and there are 5.6.

Q 5.6 is correct, then if we multiply the barrels produced during that month by 5.6 that will just represent the number of cubic feet of oil that was produced during that month, will it not?

A Yes.

Q Will you do that?

A 84,000.

Q That is correct, 84,000 cubic feet, and then if we add to that the cubic feet actually occupied by the gas in the formation, that will give us the total number of cubic feet of displacement which occurred during that month?

A Providing that they are separate, completely separate.

Q Yes?

A It would be 229,400 cubic feet.

Q 229,400 cubic feet, for the sake of simplicity let us call it 230,000 cubic feet?

A Very well.

Q Now for the sake of our argument, let us assume that that forty acre space is in the form of a circle, and will you determine the circumferential distance around that circle?

A Forty acres? 43,560 is the number of square feet in an acre.

Q Correct?

A By forty acres?

Q Yes?

A See if I have this right, that is 1,742,000 square feet?

Q Yes,

A And you want to know?

A I want to know the radius of the circle which would encompass that much acreage, in feet.

A You do not want it just, 750 roughly.

Q All right, that is fine, now from that will you determine the circumference of that circle?

A The circumference of that circle, 4,610.

Q All right, let us call it for the sake of convenience, 46000 feet, is that right, I mean 4600 feet?

A Yes.

Q Now, I believe you said during your testimony that Dr. Link's figures concerning porosity were accepted by you?

A Yes.

Q And during that testimony, you heard the testimony, did you not ?

A Yes, I did.

Q Dr. Link agreed that his oil saturation thickness correspondended with the four foot approximately which I used, do you remember that, is that correct?

A Would you mind saying that again?

Q To review your memory in that respect, I believe Dr. Link assumed a fifty foot thickness of which about 8% would be the average porosity of the oil saturation?

A Youare getting , I am not just sure that I remember that figure exactly. I am not an expert on the phases of porosity and how much porosity there was there, and how many feet was porous and what percentage of

it is and while I listened to the testimony I am particularly interested in this.

Q Surely. I realize that, but I wondered if it would be all right, pending getting Dr. Link's evidence on that and reading it to you, to say, you thought that was the figure?

A As an illustration.

Q Let us assume that is correct?

A All right.

Q Which would give us four feet of oil saturation. Now four feet of oil saturation would give us, and assuming that you are using about half of the gas, just assuming that now for the purposes of this calculation, that would give us an eight foot section which I used in my figures, that would be the gas and oil?

A Just wait until I see if I have got that. It would be half gas and half oil.

Q That is right?

A And it would be 8 feet made up at 50% gas and 50% oil.

Q That is right.

A And that is the section you gave us as I recall.

Q 8 feet in all?

A Yes.

Q That would be the number of feet of porous open space in the section?

A Yes.

Q Then that would be an average thickness of 8 feet in there, in other words, if we had a pipeline forty-six hundred feet long and eight feet deep, that would be our pipeline, would it not, so far as the movement of

this oil is concerned.

A That is around, this distance is 4600 feet.

Q Yes, in other words, the area around the well on the outer edge of this line of eight feet thick opening, represents the opening through which this oil and gas might pass out on that outer edge?

A That seems to me an awful jump now. You are not referring to any of our wells down here, are you?

Q No, this is purely theoretical?

A Oh, I quite agree.

Q You agree with that?

A Yes.

Q Then in that event, the total opening through which this oil which was produced in the month, and moved would be represented by multiplying 4600 times 8, would it not?

A Yes, that is the area. In other words, it is in the shape of this piece of paper, such as I have here, if I may illustrate, this is eight feet this way.

Q That is right?

A And 4600 feet around.

Q That is correct?

A That would be 36,800 square feet.

Q That is right. Now then if we divide 35,800 into that 230,000 that we have previously estimated, that will then give us the number of feet that that oil moved through that opening, would it not, in that length of time?

A I have the area so many square feet and I have so many cubic feet, that is right, it will move a certain distance.

Q That is right?

A Which will be, oh near enough, six feet.

Q All right, in other words that oil and gas moves six feet on that outer edge in a month?

A That would be about right.

Q And in a day how much would that be?

A Well you can reduce it to inches.

Q It would be about a half a foot, would it not?

A Yes, about six inches.

Q Then for all practical purposes, there is a very slight movement out on the edge of that forty acre drainage, is there not?

A That is right.

Q And for practical purposes then we can consider over a day's period at least, that container as being a set container, cannot we?

A Now we are getting away from the theory end and getting back to the wells.

Q Yes, that is right?

A If we are to get back to the wells now, we have a different story. This is all done, a mile and a half underneath the ground, my Lord, I do not just know what takes place myself, but I can use my imagination to the very best of my ability; what I visualize is that there is a different rate of travelling depending upon the pressure radiant which exists from the bottom of the hole back out into the radii in the formation.

Q Exactly, did you finish your answer?

A To the best of my ability.

Q And in what direction will that pressure rediant be, will it be further out or less?

A

A As we figured here it might be six inches.

Q I mean the pressure radiant now, as you go away from the well which direction does the pressure go, up or down?

A Oh, it goes up.

Q What effect would that have upon that 230,000 cubic feet of gas displacement which we figured here?

A It would be less.

Q In other words, our figure for half a day is higher?

A No. Wait a minute. You see there are very many factors in here which you have not enumerated to me, when you ask me such a question as this, I do my best to answer it, but at the same time I know my answer does not fully take in all the factors which are in my mind, with regard to the actual well itself, and I find myself in a rather difficult position. I want to answer your question as accurately as you are asking it, but at the same time I have a reservation myself which I am not expressing to the Commissioners with regard to the answer I gave. Now the question you asked was, we figured this thing out at 110 atmospheres, that was at the bottom of the well, now you get back into the formation and it is 115 atmospheres. You get back a little further and it is 120 atmospheres. You see? Now the jump between 110 and 120 is not a great difference in percentage.

Q How much is it?

A Well, it has already, if I take ten over 120?

Q About 8%?

A 8%, so that is you take 8% less volume, that has to be compensated for by a little faster rate of

travelling. Now the other factor which bothers me in this, is that a great deal of this gas in these pressures is in solution in the oil itself, and that lowering of the pressure brings that gas out of the solution. Where it has a separate existence, it occupies more space, and I visualize that some of that oil does not travel at all, but when the gas comes out of it and occupies this space which has been so clearly brought out, that oil then is left forever behind, so I must qualify my answer inthat manner, which is back to the evidence that I gave in the first place.

Q All right. Then as I understand, you have two criticisms to make of this six inch estimate which, of course, is only an approximation, and you brought into your argument two points, one of which was that the pressure radiant increased away from the well; the other was that in your estimation some of the oil was left behind and that the gas was the thing that did that travelling. Now as a matter of fact would not those two factors tend to decrease this figure to which you have objected? If you are going to leave oil behind, then certainly you will not move through that circular area, you will not move 15,000 barrels of oil, you will move some figure less than that?

A Please don't go too fast for me, if the gas comes out of the oil by, we will say 750 feet from the well and it was in solution, then it takes up part of the space of the oil or oil which had been previously taken out.

Q How much of that space would it take up?

A That would depend upon the various factors of pressures which the gas would leave.

Q I think we have some fairly good criteria on that. Approximately how much gas will go in solution in a barrel of oil at atmospheric pressure?

A I cannot tell you.

Q You do not know?

A No.

Q About how much gas is represented by a gallon of gasoline, do you know that?

A Oh, I do not know it offhand. I can look it up though.

Q In other words you are not able to calculate the amount of gas which would come out of the solution in the oil, you have no data upon which to base an opinion?

A I can go and look it up.

Q Could you do that?

A I can, yes.

Q Will you?

A Yes. Now when I am looking this up, do you want it for any other, when you said gasoline, what did you mean?

Q I would like to know what your actual displacement along the edge of that forty acre patch would be, taking into consideration all the variables which you have enumerated or of which you can think?

A You realize that I didn't have any movement at all, this is so far as I was concerned?

Q I was under the impression you were against taking

the container as a constant for this purpose, am I mistaken in that?

A Now let us get ourselves orientated around here, in making the estimates of the amount of oil and gas left in the ground I did not work on the basis of calculating the amount of pore space and the movement through it, or any such basis as that at all. All these figures I am now supplying, and data being supplied is in answer to the questions you are asking.

Q And I might say these questions are all in direct line as you will see when we get through. The point I am making is this.....

A I want to make a note of this because there are several numbers of factors, a number of things I was to collect, now you were asking me to produce just exactly what?

Q I am asking you to calculate, taking into consideration all of the variables which you wish in this, the actual travelling along this theoretical line in inches per day, under the assumption that we have already made of 15,000 barrels, and 16,000,000 cubic feet of gas?

A I thought it was something to do with the volume of gasline ?

Q I ask you that because I was going to figure it for you but if you do not know that, I prefer you to find that out and make your calculation taking into consideration all these variables which you feel I have neglected.

A Well I would just like you to read to me the question which you want me to work out. I will be glad to do it as best I can, read to me exactly what you would like me to do.

Q I wish to know the distance through which 15,000 barrels of gas and 16,000,000 cubic feet of gas would move through the cross-sectional area eight feet deep and with a length equal to the circumference of a 40-acre circle, would move in one day, assuming an average bottom-hole pressure during that month of 1655 pounds, a pressure at the edge of that circle which suits your idea, of what you consider that pressure would be under the offset conditions existing around Royal Canadian No.1 in May 1938, I would like to interject a question here, was that May 1938?

A Yes.

Q THE CHAIRMAN: You will prepare that then, Mr. Davies?

A I will do my very best.

Q That is three things that you are undertaking?

A I have three things, that is the gas and oil reserves of the gas-cap; the average cost of a well in the gas area and the average cost of a well in the oil area.

Q DR. BOATRIGHT: You understand now in this cal-

culation you are to take into consideration----

A Perhaps I had better write this down too.

MR. NOLAN: How many marks do we get for the answer?

MR. FRAWLEY: It depends on what the answer is.

WITNESS: Teacher, you can put me down to the bottom of the class.

Q DR. BOATRIGHT: You are to use in these calculations all of the variables which you feel should be taken into consideration.

A Yes

THE CHAIRMAN: And I suppose specify what they are?

DR. BOATRIGHT: Yes, thank you.

Q DR. BOATRIGHT: Coming back then to our bottom-hole pressure and our discussion of displacements which occurs therein, will you please give me your idea of what other factors should be taken into consideration in the reservoir in figuring that bottom-hole pressure.

A What other factors than the measurements themsleves?

Q No, other factors than displacements.

A See if I understand that question correctly, that is when the oil and gas is withdrawn from the well you are asking me if there are any other factors that would effect the measurement of the volume which you take out relative to the place occupied with regard to bottom-hole pressure drop, is that it?

Q Yes.

A And you want me to answer that right now?

Q Yes.

A One would be the question, if there was a water drive----

Q In your estimation is there a water drive in this field?

A No I do not think so.

Q I think we are all in agreement on that, so that is eliminated?

A Yes.

Q All right.

A The factors, I would say the gas coming out of the solution and occupying this space. I would say all these questions of permeability, which are so variable and so unknown, I would say the question of off-set wells or wells that are affecting the drainage area; I would say the position of the well on the structure itself, whether it is down, lower down in the dip, I do not know as I have got them all. I think, I would have to take my time?

Q Take your time.

A To see if I have my answer complete, I have done the best I can.

Q Take all the time you wish.

A I think perhaps that is all I can think of at the moment.

Q THE CHAIRMAN: Would the method of production in the way of getting production in off-set wells have an effect.

A Very clearly.

Q One person might be operating one well in one way and another in another way and would it have a bearing?

A It would have a bearing.

Q DR. BOATRIGHT: Now let us summarize these facts, one is permeability, that is a constant for any particular well.

A That does not change, that is right.

Q Position on structure does not change, does it?

A No.

Q Porosity of the formation does not change?

A No.

Q In fact none of the factors which you last listed change in a given well except the off-set rates of production, do they?

A And the rapidity of the rate of production.

Q Yes, so we will grant that the off-sets do affect this position but all the other conditions are steady, are they not?

A Yes.

Q All right, then the bottom-hole pressure in the well itself is the result of a state of constant things with the exception of the off-set production and the rate at which the well itself produces, is that not right?

Yes. I think that is all right.

A All right, that being the case then the gas-oil ratio at a particular time depends upon the rate at which that well is being produced and also---

A Just a minute, if you would not go too fast so that my brain will grasp this as we go.

Q Excuse me, and also the rate at which the off-set wells are being produced at the time the gas-oil ratio is taken.

A That is, these are the variables now, that does not

get away with permeability.

Q No, these are the things that vary though in the taking of the gas-oil ratio.

A I think that is right.

Q Putting it in another way then, the gas-oil ratio for a given rate of flow in a particular well is purely a function of the bottom-hole pressure at that time, is it not?

A I think it is, I am not just certain that that is a complete answer but I think it is, that is dealing mathematically now.

Q Well we are dealing with practical things now, we have dropped from the theory into the realm of the practical.

A I gave you a number of examples of exceptions to that, as the pressure went down we had our gas-oil ratio dropped and I told you I did not know what the reason for it was, and that occurred at certain stages of pressure drop. Now another matter which shows how careful we must be, taking a theoretical consideration, there is always some factor, when you are going to operate an oil well, that sort of modifies it and throws it out.

Q How many wells have you found that varied this rule we are talking about?

A I can give you examples of the wells.

Q How many?

A There is Model Spooner Reward No. 1, and there is National Petroleum No. 1. We have definite records of those, Advance 5-A and there is some indication of the same thing with regard to the Model well. 4 wells

Q Were all of these wells measured with orifice meters?

A I do not know as they were. There are orifice meters there but I do not know that they were run through the meters all the time.

Q Then granting these fixed wells disprove this theory, you have four wells out of how many in the field that disprove this theory.

A About 60.

Q Total wells in the field.

A Oh we are talking about crude oil wells now?

Q Yes, but you have your gas-oil ratio on your gas wells too, have you not?

A On the gas wells?

Q Yes.

A No I didn't give you. I gave all the data I gave you was on crude wells.

Q Well now these four wells you have mentioned, how many of these are on the gas-oil contact?

A Well it is where you define it, if you define it where you do it is quite close, if you define it where Dr. Link does it is half a mile from it.

Q Point out the wells, where is Advance 5-A?

A Well here is the Model well up here.

Q And is that a gas-cap well or is that an oil well?

A That is an oil well and has been for some years.

Q But it was originally a gas well?

A That is right. That is Advance 5-A (pointing).

Q That was originally a gas well, was it not?

A That is right. Now these wells here were all oil wells. Here is the National No. 1 and here is

Model Spooner No. 1.

Q How about that Model Spooner well, was that a straight hole?

A I think it was reasonably straight. I was around that when they were drilling it.

Q Did they run an acid bottom on it?

A Yes, a number of them.

Q How far off was the deviation?

A I cannot say. I see a great many in a year and it is hard to remember, but it was not very far.

Q How about that other one?

A The National?

Q Yes.

A It was quite good.

Q Was that a straight hole?

A It is drilled and finished with cable tools.

Q So of the four wells cited, two of them were doubtful oil wells, that is they came in as gas wells and then changed to oil wells?

A That is right.

Q In other words really of the cases you have mentioned as being exceptions and of which you are not sure that your gas measurements are correct, there are two out of those four wells, is that not correct?

A That is true but I am not sure but what all the wells, reached this stage of pressure that they might not all show the same.

Q We are dealing with facts as they are now and those are the only ones you know of now, is that correct?

A That is correct.

Q In other words you are going to condemn the theory because 3% of the wells fail to show it, whereas 97% are showing it?

A I am not condemning the theory nor am I proving it. I am just pointing it out.

Q As an engineer if you were brought an idea that was 97% correct would you not say that that was, for all practical purposes, a good theory?

A I am not very much on theory, Dr. Boatright. I would take the exact wells and see if I could examine them and find out what is happening.

Q Well this is on the basis of your examination, 3%, on the basis of your examination?

A That is correct.

Q You find a thing is 97% correct and 3% wrong?

A That is right.

Q And in the 3% which is wrong you were not even sure of your gas measurements?

A That is all correct.

Q Then it seems that that theory is practically correct, is it not?

A No it does not.

Q Why not?

A That is just my opinion because the wells have not all reached this pressure. You see when they decline, the rest of the wells get into this pressure stage, they may show it too, but I do not know what they will show until they get down there. I would like to oblige you on that but I cannot just meet you.

THE CHAIRMAN: I think at this moment we might

relieve the reporter for a few minutes.

(A five minute's adjournment which was here taken).

Q MR. BOATRIGHT: Mr. Davies, coming back to the question of this container. You made some such statement as this in your direct examination, "but getting a quarter of a mile away and the rate of travel is so slow that it will equalise perhaps over a ten year period, but certainly we have had ten years and it did not equalise", then there was a question "Just before you proceed can you say what the distance would be?". "I would say a quarter of a mile", then in effect that means does it not that that container is practically constant at a distance of a quarter of a mile away?

A Yes, subject to whatever slight movement there is, that is right.

Q Which was the point I was trying to make with these calculations, was it not?

A I did not tell you that, you told me.

Q I was trying to show that the container around the well was more or less of a constant, that there might be a slight movement around the outside edge but that it would be so slight that it would be negligible.

A I will agree with that.

Q Then in that event it will not be necessary to do all these calculations?

A Thank you very much, I will give you a present when Christmas comes.

Q It might be well to wait.

A All right, but I don't think so.

Q Now incidentally I believe you said this before we closed that you did not pretend to be an expert on porosity and permeability.

A No, Dr. Link does all that testing.

Q In other words in your estimate you did not take that into consideration except as he gave it to you?

A That was based entirely on Dr. Link's evidence.

Q In fact all your statements of porosity and permeability are merely statements which have no backing except in what Dr. Link told you?

A I am following and accepting Dr. Link's evidence.

Q Now in connection with the four-foot of oil saturation and Dr. Link's agreement with eight feet I would like to read from the record just in order to establish that eight- t thickness, page 200.

"In other words', in cross-examination of Dr.Link, 'Q. In other words that would be the same as saying my figure of eight feet was correct, if I assume 50% was saturated. A. Yes."

Q Do you now remember that?

A Yes I remember that.

Q Then coming back to our bottom-hole pressure the only thing that can effect us then is the displacement in the reservoir itself, whether that displacement come by virtue of oil production or gas production or gasoline production, is that correct?

A That is right.

Q Now that is in the particular area of influence of

that well, is that correct?

A That is right.

Q And you have instances in the field where wells have influenced each other, have you not?

A Oh positively.

Q Did you say you have no evidence of influence?

A I said positively.

Q You positively do have influences?

A Yes.

Q So that the only thing then that controls the bottom-hole pressure is the withdrawal from the oil well under consideration and the influence of surrounding wells' withdrawals upon bottom-hole pressure, and we will make it now complete that whatever that slight----

A Or slow movement.

Q Which is practically negligible?

A It is very small.

Q In other words, then the gas-oil ratio has nothing to do with it except insofar as it determines what the displacement shall be out of the reservoir over a given period of time, is that not correct?

A I didn't quite get that, nothing whatever to do with what?

Q The only effect that the gas-oil ratio has then upon bottom-hole pressure is merely that they determine the amount of displacement which will take place from a given productive area.

A Of two different substances?

Q Yes, is that correct?

A That is correct.

Q In other words then as a well begins to produce it has a high gas-oil ratio, which decreases?

A Pardon me now.

Q It begins to produce at a given time.

A Are you taking a month?

Q As we open the well up the gas-oil ratio is first high, then it gradually decreases until the minimum point is reached and after that it increases.

A Now you are asking me that question?

Q Yes, I am asking you that question.

A That decrease part all takes place in a matter of minutes and so for all practical purposes if we are dealing with the production of a well we start with a low gas-oil ratio. I quite agree with you, Dr. Boatright, that when you first open the well you get gas just momentarily until the liquid starts coming and then you start from there on and have low gas-oil ratios from the commencement of the lifetime of these crude wells.

Q Now then for a given bottom-hole pressure in any given well then, the rate of production from that well will determine what the gas-oil ratio shall be, does it not, now let me explain---

A Yes.

Q We have a bottom-hole pressure in this well at the time we come there, that bottom-hole pressure is determined of course by the amount of withdrawal which has taken place out of that area over a period of time, whatever it may happen to be.

A Yes.

Q But we go to a particular well to take the gas-oil ratio and we have a given bottom-hole pressure at that time?

A Yes.

Q Now the gas-oil ratio that that well will have then is a direct function of the rate of production, is that not right?

A That gas-oil ratio there, we will say WELL-A, now commencing to produce, will be related to whatever the bottom-hole pressure was in that area.

Q Yes, but nevertheless it will also depend upon the rate of flow from that well?

A Oh yes, from then on.

Q In other words if you go to a well to take the bottom-hole pressure you will vary, I mean to take the gas-oil ratios, you can vary the gas-oil ratios by varying the rate of flow of that well, cannot you?

A Well I do not pay much attention to these daily reports to determine it, Dr. Boatright, because I have taken the average over the month. How many cubic feet of gas was produced over a monthly period and barrels of oil.

Q I think you cited that very condition, didn't you?

A Which?

Q That in a given well the different rate of production determines the gas-oil ratio, have you not had any experience with gas-oil ratios?

A How do you mean, have I had experience.

Q Yes, in making them from day to day.

A I am continually, we are working with these wells continuously and watching how many cubic feet of gas and how many gallons of oil there are.

Q You have seen wells producing at different rates?

A Yes.

Q In a given time?

A Yes.

Q And have you not noticed that the gas-oil ratio depended upon the rate of flow?

A I do.

Q Then they do vary from the rate of flow from that well?

A They do, and also all of that being predicated on the rate of variation if you like, where the well has a high bottom-hole pressure or where it has a low bottom-hole pressure, where it is a low bottom-hole pressure well.

Q Certainly, but at a given pressure you can vary the gas-oil ratio by varying the rate at which that well is producing?

A That is over hourly periods and perhaps over a day.

Q Any given period.

A I want to explain this because it is clear enough, you are asking me and I want to be sure that the commission understands my answer. If a well is restricted in flow, producing regularly, it will have built up at the bottom of the hole, nearer to the bottom-hole pressure, and the amount of gas produced with a barrel of oil will be more than if we were suddenly to open this well and all that oil accumulated around the bottom of the well is taken

out if that be the condition there; at least it makes a lot of oil for a few hours and then you get another condition set up where you are pulling on this well very hard and the gas-oil ratio rises. I take it that is what you mean.

Q That is it.

A This thing can vary in a day's period of time and then it will settle off again. When you adopt a new condition and it takes these wells usually from around forty-eight hours when you change the condition on it before it will steady off again. It is just quite interesting to watch. You vary the pressure of the well and then how long it will take before it will reach it's equilibrium. Now all we can be sure about are the conditions we get on the surface. How many feet of gas. How many barrels of oil. So much pressure. All those factors are covered on the surface. The gravity of the oil enters into it. We have heard quite clearly that that effects the price, my Lord. What you get paid for it. If you draw off a well too fast you can drop the gravity of your oil and that governs the question of how much you get paid per barrel. Now all these things we measure on the surface are translated down in the ground again and I take it that Dr. Boatright is asking me to translate that down into the ground and then I get into an unknown territory as far as I am concerned but I want to make clear that all these things take twenty-four hours, usually forty-eight hours before they adjust them-

selves to the new level.

Q Considering that forty-eight hours, well let us confine ourselves to that, we have already gone through bottom-hole pressure and we have found that the bottom-hole pressure is a function of the displacement which has taken place out of a given area, and we have cases since October of this year where the bottom-hole pressures are still rising, after these heavy withdrawals that you have objected to, is that not true?

A Yes.

Q So it is not a matter of twenty-four hours nor forty-eight hours but it is a matter of months.

A No, I do not quite agree. Well all right then, It is a matter of two months we know at least.

Q At least two months. In other words it is not a short twenty-four hours, I have a reason for asking this.

A I do not think that it is a matter, I take it, if we shut in a well for twenty-one days we get a bottom-hole pressure which is practically steady and we have a few illustrations of wells that have been shut in.

Q Now that time that it takes is also a function of the distance of the well from the withdrawal area and according to your own figure here of a quarter of a mile, it would not have a very great effect over a ten-year period, is that correct?

A That is almost entirely as I see it a matter of permeability.

Q Let us summarize up this gas-oil ratio information which we have developed here today. We have found

that the gas-oil ratios depend primarily upon the rate of flow in the particular well which is being considered; we also find that the gas-oil ratio that we found at one of these particular rates of flow is a function of the bottom-hole pressure of the well at the time that well is being flowed.

A That is correct.

Q And that bottom-hole pressure in turn is a function of the amount of displacement which has taken place in the top from that particular well and is further modified by the displacement which has taken place from the immediately surrounding area of influence of that particular well?

A That is all right.

Q Is that summary correct?

A That is quite correct.

Q Now as to the amount of the gas-oil ratio, that depends almost entirely upon the position of the well from a structural standpoint, does it not?

A Yes.

You have a good deal, just wait a minute now until I get this right, that is where the well starts off with a 1000 cubic feet per barrel.

Q Yes, at some we will assume the optimum rate of flow for all this gas-oil ratio discussion.

A And that gas-oil ratio would have been originally entirely on the position on the structure, well that is a question which I just do not know.

Q Let us put the question, I am not trying to trip you up in this particular instance, now in the area that you have called the area---

A We are at least frank, my Lord.

Q In the area that you have called "B" the average gas-oil ratio of all the wells in that area will be lower than in the area you call "A", is that not right?

A Yes.

Q And it is entirely possible if production is on down the flank that the gas-oil ratio will be lower there?

A Yes.

Q At the best rate of flow?

A Yes.

Q But is it not also true that if we produce a well in area "B" at an excessive rate of flow that we might have that oil-ratio higher than producing the well at the optimum rate of flow in area "A".

A I agree entirely with you.

(Page 399 to follow)

Q That is absolutely correct?

A Yes.

Q Do you know about what the average gas-oil ratio was in the wells in say Area B?

A Yes, about, on the average it was about 1,000 cubic feet.

Q About 11,000 cubic feet?

A Yes, that is not exact, but it was about that.

Q And what was the average gas-oil ratio of the wells in Area A?

A Where the pressures were not reasonably high at all, they were about 1,000 cubic feet too.

Q In Area A?

A In Area A.

Q I have figures of 8,000 of an average for the last set of gas-oil ratios?

A Yes, but we are talking about when the wells first came in.

Q No, I am talking about the present gas-oil ratios in these two areas, the present?

A I thought you meant when the wells first came in.

Q No, I am talking about the present gas-oil ratios, as of your optimum figures, what is the average?

A I will just look and see if I have averaged them. I find I have not averaged them, and I would have to add them up and average them.

Q You have not that average?

A No, I didn't average them.

Q I wonder if you would do that to-night and have that average for to-morrow. Now, is it not true that the field in the past has been producing under very poor operating conditions?

A I will agree with that.

Q You will agree with that?

A Yes.

Q And has led to abnormal pressure decline, in various areas of the field and in fact in the field as a whole?

A Certainly in a good number of wells.

Q Yes, and that wasteful utilization of your natural resources has primarily occurred in the gas area, has it not?

A Yes, the wells have been operated and gas has been burnt in the air. You are not referring to that, you are referring to operating?

Q I am referring to the wastage and high gas-oil ratios?

A I agree with you.

Q The gas area has been the bad part of the field from that standpoint?

A Well, the crude area is bad too.

Q They have both been bad?

A Terrible.

Q But the gas has been much worse?

A I can tell you, if you are down in Turner Valley, as I am, continually, the way some of these crude wells are operating is terrible, they couldn't be worse.

Q Well, that results in abnormal pressure drops, does it not?

A That is true.

Q And I believe you have already agreed that the gas-oil ratio of a particular well is a function of the pressure, the bottom-hole pressure, in the well, at the time the gas-oil ratio test is taken, is that correct?

A Yes, I think that is true.

Stanley J. Davies-Cr. Ex.

Q That means then any period, any recent period, and particularly right during these last few months, has been a very bad time to make any gas-oil ratio estimates in the field because of the fact of the 28,500 barrels, which was taken out under the Commission's allowables in September, is that correct?

A Yes, it was started on the 2nd of September.

Q And that excessive withdrawal resulted in upsetting the bottom-hole pressures in the field very badly?

Oh, very much so.

Q And those bottom-hole pressures, as a matter of fact, this last month, showed an over-all increase, did they not?

A Yes.

Q Indicating that there is a very unstable bottom-hole condition at the present time?

A No, I do not think that is altogether true now.

Q What caused that pressure rise then?

A Because of the lower rate of withdrawal.

Q Which means that the pressures are equalizing throughout the field and have been ever since that withdrawal?

A That is true, but now I want to add something to that. The last rate of withdrawal was, set up an increase, it was 11,500 barrels, and now it is 12,500 barrels, so we will have a condition here where the 12,500 barrels will stabalize, I can give you a good number of increases.

Q That is further going to upset that pressure equalizing in the field?

A That is going to start to drop again.

Q It is going to upset it. It is not going to stay where it is, it is not equalized now because it is still rising and now the displacement which is going to occur will

cause a drop and, therefore, the reservoir all during the period from September on has been in a state of flux, in other words, the bottom-hole pressures throughout the whole area are changing all the time, are they not?

A That is right.

Q Some are changing up and some down?

A Yes.

Q You also said, did you not, that the gas-oil ratio in the particular time of the well's lifetime, and we will say the optimum, that is the best gas-oil ratio we can get out of the well, is a function of that bottom-hole pressure?

A I think that is so.

Q Now, in the estimate which you made, during what period did you take the gas-oil ratios?

A During October.

Q That is during this period when everything was moving up and down, the pressures were not equalized through the field at all, didn't you?

A They are rising, the bottom-hole pressures.

Q The pressures were rising, what does that mean, the gas-oil ratios were doing?

A Cutting down.

Q And you took that in a month when the field itself was in a very, very unstable condition, as has been illustrated by the increase in bottom-hole pressures during the last month?

A Dr. Boatright, as long as this field is going to be produced it will be and has been produced, it has always been unstable?

Q In a state of flux with widely varying bottom-hole pressures and with widely varying gas-oil ratios?

A Yes.

Q And doesn't it seem to you a very poor way of estimating reserves?

A It is the only way to estimate them in Turner Valley.

Q We seem to have a difference of opinion there. Here we have a field whose bottom-hole pressures are admittedly fluctuating between wide limits and which depend upon the rate of withdrawal, which has admittedly been very bad in the past, and which has only recently been temporarily corrected, we know that the bottom-hole pressures vary in different wells from month to month, all over the field. We know that the bottom-hole pressures in the lower part of the field are greater than the bottom-hole pressures in the A area of the field, and are much greater than the bottom-hole pressures in the gas part of the field. We also know that the gas-oil ratios of a given well depend not only upon the rate at which that well happens to be producing at the time that gas-oil ratio is taken but it also depends upon that unstable bottom-hole pressure. Now, we come along, and in your estimate you use as your basis Area A, which is admittedly a high gas-oil ratio area, which has been produced under very poor production practices and which has obtained in the gas area, which has been badly wasted, from that gas-oil ratio data you determine the remainder which is in that field, is that correct?

A That is correct.

Q And in taking that gas-oil ratio you take the bottom-hole

pressure drop between two given periods of time, when you know that the bottom-hole pressures were fluctuating between wide limitations?

A Now, wait a minute, the first bottom-hole pressure, that is not true.

Q Why was it not true, was not the field being produced under more wasteful conditions?

A Many of them, the wells had been shut in for a period of time and then measured.

Q How many of these wells?

A I would have to count them up. I will tell you that, Royalite 28, for example.

Q Just count them and give me the total number?

A I probably can say all the Royalite wells have been taken, the bottom-hole pressures have been taken at a length of time to get stabilized conditions.

Q And how many wells are that?

A Well, the ones they operate, I think it is pretty nearly 50% of the field. I will count the numbers I have records of.

Q How many Royalite wells in Area A?

A In Area A?

Q Yes?

A Perhaps Dr. Link can tell us.

DR. LINK: Nine in Area A.

Q DR. BOATRIGHT: And how many wells in your total Area A?

A Thirty-six.

Q In other words, about 25% of the wells had closed-in pressures, how long were they closed in when these pressures were taken ?

Stanley J. Davies-Cr. Ex.

A That is where I would have to look up the record, take the Sterling Pacific No. 6.

Q What would you say would be the maximum time that any well in that area was closed in when you started your record?

A I can get that figure in a moment, I think 26, 17 days.

Q That is the maximum?

A I think it is, yes.

Q And we have evidence right here to-day that at least two months is required for pressures to be equalized throughout the area and that requires that not only that well but the whole series of wells in that particular drainage area be closed in?

A Now, then, this will make all the original pressures, that factor helped too, you see.

Q Yes, but they may be either high or low, may they not, depending on the conditions in the well?

A If you are draining on it. I gathered all that carefully. These are all going to be too low when you take the 24 hour basis. They are all going to be too low. They will be too low.

Q They might be too high?

A How could they?

Q You have the situation of affairs right now where the whole bottom-hole pressures are increasing?

A No, the increase started as soon as they cut the field down.

Q Did you not take these bottom-hole pressures in that area, did you take any consideration whatever of the bottom-hole displacements which had occurred in what

you considered the drainage area of each one of these wells?

A No.

Q And yet you know the bottom-hole pressure in a given well is a function of that displacement?

A Whether I know it or not, it is not a factor that I took into consideration.

Q You didn't take that into consideration?

A No.

Q And here this afternoon you have admitted that that is a factor?

A Oh, undoubtedly.

Q And that was not taken into consideration?

A No.

Q In arriving at your initial pressure?

A All your calculation does not mean a thing because of the conditions of the container down there. We have already shown very clearly, that could be anything from one acre surrounding one well to four or five acres, or it might be in any direction, the permeability and porosity, you do not know a thing about it.

Q Quite right, and that makes your calculation very unreliable?

A You are saying that to me but I do not think it is.

Q And yet you admit that your bottom-hole pressures are functions of permeability and porosity and the rate at which these other wells have been produced throughout their lives and the length of time it was shut in?

A We come down to this, Dr. Boatright, that we have a certain amount of oil produced, we have a certain amount of gas produced, we make the very best estimate we possibly

can on the bottom-hole pressure at the time that well comes in, we take the highest pressure in November, the highest pressure in November, and we take the difference

Q What do you mean by the highest pressure in November?

A If there was a bottom-hole pressure on, we will say, October 31st, and I will read you some examples, and these are all actual records, and we are not guessing at it, Prairie 1445.

Q THE CHAIRMAN: Mr. Davies, may I interject to ask, are these your own records?

A These are the records of the Royalite Oil Company, and there are a few taken by the Conservation Board, of wells other than those owned by the Royalite Company, and I might further explain, my lord, that the first bottom-hole bomb was brought in by the Royalite, that is this little instrument which measures this, and they took bottom-hole measurements for other companies, and we have there that record, anything which is in the Royalite record, which they have, in fact it is the most complete record which is available.

Q I just want to be clear, you are not putting them forward as taken from your own personal records?

A Oh, no, no, my lord, it is quite a job.

Q Yes, quite so.

A In August Prairie, I think I covered that in my evidence, that particular well, showed 1445 pounds, in October it showed 1545, and in November it showed 1690. Now, that pressure is all rising.

Q DR. BOATRIGHT: Yes?

A Now, the question is that we take the figure, 1690.

Q Yes?

A Now, then.....

Q Just right there though, when did you take the gas-oil ratio?

A In October, that is the last one we had.

Q And you know the pressure was less in October than it was in November?

A I grant you that.

Q And, therefore, the gas-oil ratio was not a true criterion for those two months, was it?

A It may be out.

Q It was out undoubtedly, was it not?

A It may be out. How would it be if we took the November gas-oil ratio, we now have it.

Q It would make your estimate much better?

A Well, it will take some few hours to do, but we can get the November figures when we work this all out. They were not available, my lord, but by getting the record from the.....

Q Is that record available?

A I think by making quite an effort, by going to the various companies we can get it. It might take us a couple of days to do it.

Q I see, don't you think it would make a much more accurate basis than using the gas-oil ratio basis for October?

A ~~Oh, certainly it will be more accurate.~~

Q In other words, it would make quite a difference in your figures ?

A No, it would not.

Q It might?

A No, it would not make quite a difference.

Stanley J. Davies, - Cr. Ex.

Q What did you find the relation of bottom-hole pressure to gas-oil ratio was?

A Relationship?

Q Yes?

A I didn't work it out at all.

Q So you do not know what the effect would be?

A I know one particular well.

Q What would it be per 100 pounds?

A Oh, it is so small.

Q How much would it be?

A Oh, it is not going to be 2%.

Q On what well?

A I will get you the exact figures, Dr. Boatright.

Q Do you have them here?

A No, I have not.

Q I would like to have those figures. They would be interesting, I believe. Now, coming back to this original bottom-hole pressure then?

A Just a minute, I want to write this down exactly what you want me to get, the November gas-oil ratios?

Q Yes, the November gas-oil ratios?

A Of all wells?

Q Yes, of all wells in your Areas A and B, and the average change in thousands of cubic feet per 100 pound pressure change?

A Just a minute now, per 100 pounds.

Q Bottom-hole pressure change for Areas A and B. Have you anything else you wish?

A No, I just wanted to be sure I got this down, the November gas-oil ratios, and the bottom-hole pressure change for Areas A and B.

Q That is right.

THE CHAIRMAN: Now, are we clear on all of the things that you are to provide?

A My lord, might I read them over?

Q Please?

A The gas reserves in the gas area and in the oil area.

MR. NOLAN: Just there, Mr. Chairman, it appears to me that that is a very big task. Mr. Davies will explain whether it is or not. Is the understanding that he is to prepare that to-night for to-morrow, because my understanding is that he cannot do it in the time at his disposal.

MR. FRAWLEY: Well, he certainly cannot get these gas-oil ratios, as he said.

WITNESS: That is impossible.

MR. FRAWLEY: It will take a couple of days, and you cannot do any more than that which is possible.

THE CHAIRMAN: Well, we will first get the information and see if you are agreed on that, and then we will try and find out how long it should take.

A Very well, my lord, the average cost of a well in the gas area and the average cost of a well in the oil area.

Q THE CHAIRMAN: That will take how long?

A Well, that doesn't take too long, you could probably do that in a day. You see, I have to go through the records of the Royalite for one, and ask what the wells, cost which they drilled, - which were some twenty-seven, or twenty-four wells, - and let some qualified person give me the figures and then I go to some other qualified person in Mercury Oils, we will say, and ask them for their figures. I did not really have these figures available

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myself, my lord.

Q No. Well, do you attach enough importance to it for Mr. Davies to go to all this trouble, Dr. Boatright, you know best. I am not suggesting either way.

DR. BOATRIGHT: In the event that these figures will take too long to get, it seems to me it might be well for them to prepare them, as I understand this Enquiry is to be held at a later date for the Anglo-Canadian anyway, and it may be that Mr. Davies could bring these figures in at that time, without going to the trouble now to try to work them out and after all it is a part of a complete picture of the field.

THE CHAIRMAN: Yes.

DR. BOATRIGHT: That would be merely a suggestion. However, if you feel for your information that they are not so particularly necessary I would be perfectly willing to waive them.

THE CHAIRMAN: No, I did not say that at all. I think you are the best judge of that you should require from the person you are cross-examining. We are here to listen and give such weight to it as we think proper. I was just trying to clear up the preliminary part of it.

DR. BOATRIGHT: I gathered that, sir.

THE CHAIRMAN: It understood it would be necessary for you to leave early in the week?

DR. BOATRIGHT: Saturday, probably.

THE CHAIRMAN: Yes, and so if Mr. Davies is now being assigned to two or three days' work, we will have to try and work it out.

DR. BOATRIGHT: I understand that. Well, now, in the

event that you feel you would not care to have it at a later time, and prefer to have it in this Hearing, why I believe we could waive it, or if you would like to have it come on at the time we re-convene, it might be prepared and that would give Mr. Davies plenty of time for preparation.

THE CHAIRMAN: What is the opinion of counsel?

MR. FRAWLEY: There is a possibility, Mr. Chairman, that we will have to adjourn when we have finished with Mr. Davies and that it would be well to finish with him but I will discuss it with Dr. Boatright this evening, and if he thinks it is essential that he get this further information, if he wants it for his further cross-examination, then we might have to face the prospect of letting that stand, the last bit of Mr. Davies' cross-examination stand until we re-convene, because I do think we cannot go much further. I intend, of course, to put Dr. Boatright on in Reply but that would not seem to be the convenient thing to do at the present time if the Anglo-Canadian Engineers are coming. We had better have Dr. Boatright, who led off the discussion, make his reply after we have heard the Anglo-Canadian Engineers, so I do have in mind we will be forced to adjourn after we finish with Mr. Davies now. It is about adjournment time, and we might discuss this with Dr. Boatright during now and morning.

THE CHAIRMAN: Yes, I think you should all keep in mind that so far as we can complete the picture now, and subject always to what has to be added by Anglo-Canadian or ny anyone else, the Commission would like

to have before it during the recess as complete a picture as it can get, because owing to the endeavour to speed up the work of this Enquiry, it has been thought that we would, the members of the Commission, would spend some time upon the evidence given during that interval.

MR. FRAWLEY: Yes.

THE CHAIRMAN: So to the extent that it can be completed it is desired that it should be completed.

MR. FRAWLEY: Yes, and only this morning my thought was that it would be completed before the Christmas recess, but the Anglo-Canadian, we need not go into that, your lordship has agreed they should have the opportunity which they have asked for. That is outside the programme entirely and we will just have to wait until they bring forth their information.

THE CHAIRMAN: You might discuss it over the night.

MR. SMITH: May I make a suggestion about this particular thing, it seems to me if the witness will accept Dr. Link's figure as the one used by Dr. Boatright about these wells, then he has no work to do at all. I have forgotten the figure, I think it was an average of $160,000.00.

DR. BOATRIGHT: $165,000.00. for drilling alone.

MR. SMITH: That is set forth and that would save a lot of work, if that were accepted.

THE CHAIRMAN: Of course, that was rather qualified later by Mr. Davies' reference to wells which were drilled for less money, was it not?

WITNESS: That $165,000.00 figure, my lord, was given by myself as the cost of the wells in the crude

area. Now, I was asked the cost of the wells in the gas-cap area, which is quite a different story altogether, and, therefore, I did not, have not prepared that cost to bring down here.

THE CHAIRMAN: Gentlemen, you might discuss it this evening together and if it is at all possible for us to proceed and make some headway we would like to do so, and I hope you will bear that in mind.

MR. FRAWLEY: Yes, my lord.

THE CHAIRMAN: Mr. Nolan and Mr. Frawley, I asked the witness, Mr. Davies, as to whether or not there were his records and he quite frankly admitted they are not. Do I understand that all persons interested are content that we assume that they are proper records, accurate records, or not, because the basis of Mr. Davies' evidence will have to be verified otherwise by someone else.

MR. NOLAN: My Lord if the evidence which has been offered here has to be verified by evidence as to its sources and from whence it came we will not have finished here in a year, and in order to expedite it I think we should agree amongst ourselves that when these witnesses come forward with figures that are reliable we should accept them.

THE CHAIRMAN: I am inviting your consideration of it. I cannot make the agreement for you but I am suggesting that it be considered and that you tell us as to whether or not it is common ground that that is a correct basis upon which to offer the opinions which the witnesses have.

(The Investigation was here adjourned to be resumed December 15th, 1938.)

.....

The Province of Alberta

IN THE MATTER OF THE PUBLIC INQUIRIES ACT

—and—

IN THE MATTER OF a Commission, dated the 12th day of October, A.D. 1938, to inquire into matters connected with Petroleum and Petroleum Products

Commissioners:

The Honourable MR. JUSTICE McGILLIVRAY
(*Chairman*)

—and—

L. R. LIPSETT, ESQ.

Session:

CALGARY, Alberta DECEMBER 15th, 1938

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E X H I B I T S

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(CROSS EXAMINATION OF MR. STANLEY J. DAVIES BY DR. BOATRIGHT CONTINUE.).

THE CHAIRMAN: All right, Mr. Boatright.

Q MR. BOATRIGHT: Were you able last evening to obtain costs of drilling gas wells.

A No, I have not, it takes too much time.

Q You also did not calculate an estimate of the gas reserve?

A I have some figures you asked me for.

Q Will you give them.

A The average gas-oil ratio for area "A" for the month of October 11.4 m.c.f. and for area "B" 1.9 m.c.f.

Q Did you finish?

A Yes, thank you.

Q In other words the gas-oil ratio in area "A" was about 11 times that of area "B", approximately, between ten and eleven times?

A No, you have the figures wrong there.

Q All right, what might it be.

A It is six times exactly.

Q And you primarily used area "A" in calculating your reserves in area "B"?

A Yes.

Q Did you not?

A Yes, that is correct, I actually took all the production in area "B" and added it.

Q The production to date in area "B" and added that to your estimate of the reserves which were supposed to form area "A".

A Plus the amount already produced to date.

Q Yes.

A In area "A".

Q Now if you will turn to page five in your report, the last part of the paragraph immediately above "reservoir energy and pressures" you make the statement "it is therefore necessary to deal with the average drainage over selected areas of groups of wells, some with good porosity, and good permeability, and good recovery per acre, others with poor porosity, or poor permeability and low recovery per acre". Then in that event that is equivalent to saying that in order to arrive at any reasonable figure it is necessary to take the average of the field as a whole, is that not right?

A Having in mind the pressure factor.

Q Yes.

A Which I didn't.

Q It is necessary to consider the field as a whole in these calculations?

A That is correct, I think that is what I did.

Q Did you take into consideration the gas-cap at all in your figures?

A That is in the recovery from the crude area.

Q Yes.

A No.

Q And yet that is a part of the field as a whole is it not?

A That is right.

Q You did not even have an estimate of the actual gas reservoir in that area yet, do you?

A No.

Q So you did not take the average of the field as a whole in making your calculations, did you?

A No.

Q Turning to page six, the first paragraph on the page, you say as follows "Therefore the best production method possible is to utilize the pressures that now exist in the Turner Valley area to produce the maximum amount of crude oil and natural gasoline".

A I think there should be a correction in there, "Turner Valley crude area", you obviously cannot produce crude oil from the gas-cap area.

DR. BOATRIGHT: No.

THE CHAIRMAN: Where is that?

WITNESS: That is on page six, my Lord, line eight. "The pressures that now exist in the Turner Valley Crude area".

DR. BOATRIGHT: Didn't I understand you to say an explanation of Century No.1 in the early part of your testimony---

Q MAJOR LIPSETT: Before you pass from that, Dr. Boatright, the witness has confined that to the crude area, but in the third line of that paragraph he said "As over 1000 billion cubic feet of natural gas has now been expelled", is that from the crude area or is that from the whole field?

A That is from the whole field, Mr. Commissioner.

Q MR. BOATRIGHT: Then as a matter of fact this paragraph does include the whole field.

A I say "over 1000 billion cubic feet of natural gas has now been expelled from the limestone formation, it is impossible to put this amount of gas back into the formation".

Q Yes.

A That deals with one thing and then I said "therefore the best production method possible is to utilize the pressures that now exist in the Turner Valley crude area to produce the maximum amount of crude oil and natural gasoline", and I stay with that statement.

Q Well just previously, in fact this morning I think you agreed that the field as a whole is a thing which should be considered.

A I do not think that anybody, estimating the crude as we have done, production, left in the crude area "A" or the crude area "B" need take into account the gas-cap area, utilising the method that we are or that are utilised and bearing in mind all the factors which we brought out relative to the pressure decline at a distance of a quarter of a mile from this particular crude area and so on, which we very clearly settled yesterday. As to the distance of one well from another and the method of taking the actual number of cubic feet which has been produced and the actual number of barrels of crude oil which have been produced and the pound pressure drop which has taken place and then estimating the amount of natural gas which is the force which brings the crude oil to the surface,

in the ground, and the number of cubic feet of that gas required to lift a barrel of oil, in my judgement it is the one sound method, which still has limitations as to accuracy that I believe the method I used will give the maximum recovery qualified by the fact that in high pressure areas, assuming your better production methods, which I covered in some detail, and in proving or lessening the rate at which this pressure would drop,- that has to be proven and we are dealing now with the production methods presently in use in Turner Valley,-these wells in many cases have a great deal more than 50% of the lifetime gone. Pressures have reached the point where they are relatively low and we have a portion of this area in the later stages of its lifetime and that no type of production method now, in view of the evidence of Dr. Link with regard to porosity and particularly permeability, is going to enable us to go back and put this gas back into that formation except at tremendous cost and in all these calcuations---

Q THE CHAIRMAN: And which I gather you think would not justify the operation?

A Quite right, my Lord.

Q DR. BOATRIGHT: In other words the statement on page five then does not mean what it says, is that correct?

A It means exactly what is says in my judgment. We may have different views but I still mean exactly what it says.

Q What are those factors to which you referred in

that discussion just now?

A Which factors?

Q You refer to some factors which had to be taken into consideration, what are those factors, in estimating the reserves?

A That is left in these particular crude areas?

Q Yes.

A Well one, I will go at this rather slowly now.

Q All right.

Q THE CHAIRMAN: I have factors in estimating the reserves in the crude areas.

A The qualifying factors as I understand it.

Q DR. BOATRIGHT: Yes, he mentioned a good many qualifying factors which had to be taken into consideration and I have asked him to discuss them.

A One is the question of what happened when these wells reached 300 pounds. The evidence we have, I covered it completely with regard to Richland No. 3 and Century No. 1.

Q May I interrupt there and let us discuss these two wells. These two wells right while you are on that factor.

A All right.

Q Let us turn to Century No. 1.

A Page 25, my Lord, and Mr. Commissioner.

Q MAJOR LIPSETT: Before you start, you mentioned in this page six "over a 1000 billion cubic feet of natural gas has now been expelled", can you give any idea of how much of that comes from the crude area and how much from the gas area?

A Yes, there was 56.1, I will just get it exactly

here, 56.1 billion, 56.5 billion, I will correct that, from the crude area, and the balance is from the gas-cap area. That figure is given of 56.5 on page 18 of the report and it is made up of the total amount of natural gas produced from area "A", area "B", and those areas where the Alvance and Model Oil areas produced from the beginning of their production until October 31st, 1938.

MAJOR LIPSETT: Thank you, I am sorry for interrupting you.

DR. BOATRIGHT: That is perfectly all right.

Q THE WITNESS: Now we were dealing with qualifying factors.

Q DR. BOATRIGHT: Yes, and you had mentioned Century No. 1 and I believe that you made the statement that in Century No. 1 you estimated that the bottom-hole pressure had reached the point below 300 pounds or approximately 300 pounds, is that correct?

A No, I said it was below 450.

Q Below 450.

A The last figure we have on that, just one second and I will give it to you, the last closed in pressure we have, and you can judge for yourselves then, I have it here, this is from the Government's statement, of closed in pressures in the month of, it is not on here but it is in the month of June of 1938.

Q Well in working this out did you take this last statement of the government or did you take the statement which you have included in this report?

A Century is not included in your reserve system at all, it is in the gas-cap area.

Q No, but to support your contention that no production will occur after 300 pounds is reached, you cited Century No. 1.

A That is so.

Q And in doing so you used the information which is contained in this report?

A No, this figure which I will read you now is from the Century Oil Company Well, I do not know whether we show the pressure on the graph, perhaps do, do we?

Q Yes.

A It is in the exhibit in Dr. Link's Report and therefore is not in mine but I will read you the figure as determined by the government engineers.

Q At what time?

A This is in June 1938 and the closed-in pressure was then 381 pounds and I think you used yourself a figure of adding 200 pounds, that may be a little high in this well because it has now no fluid level.

Q If we add 200 to that that would make it 581?

A Yes, last June. Now we can read the record in view of having a pressure of say 581 last June.

Q Now just another point in that connection, you are using that well then as somewhat of a criterion on what your wells will do, are you not?

A Along with that we have Advance 5-A, Miracle No. 2, Sterling Pacific No. 3, Model Spooner No. 1, Richland No. 2. Those wells we have fairly complete data on them.

Q We are talking about this Century Well at the present time.

A Well the Century was taken because it has reached a little further along the stage.

Q Let us confine our discussions to this particular well, and then if you wish we will go to the others and discuss those. This Century Well was considered in making your estimates of the oil area, was it not?

A No.

Q You have used that in making the statement.

A There is the qualifying factor.

Q That it has probably the lowest pressure at which you can produce. Now is that well in the true oil area?

A Well I can explain what happened to that well.

Q Well would you just answer that question, is it in the crude oil area, either "A" or "B"?

A No.

Q And yet you use it, don't you?

A That is right.

Q In other words in making your estimate of the field as a whole you neglect the gas-cap area but when you come to this particular instance, in the majority of cases you are drawing on wells in the gas-cap area, or gas wells, wells which were originally gas wells and now are showing a little bit of oil, is that correct?

A For information, yes.

Q In other words, in your own mind there is some con-

nection, is there not?

A Now that is quite different, because I do not agree that there is or there is not.

Q Why do you quote these wells then in attempting to forecast what the oilfield will do?

A I would like to explain why I used Century No. 1, it was a well which originally produced a discolored naphtha and then it went to producing crude oil and in May, pardon me, in August of 1937 it was a crude well which produced after acidising 5031 barrels; that was its best month's production. Now the well then started to drop off very rapidly until in the month of June it produced 647 barrels and 134427 feet of gas.

Q What gas-oil ratio would that be?

A I would have to work that out, just one minute, it is near enough I think, I have it right, 209,000.

Q Under no stretch of the imagination do you call that a true oil well?

A Oh I do not think I would call it a true oil well, no.

Q Under your own definition of a gas well that would certainly be included as a gas well, would it not, comparing even the value of the gas with the value of the oil?

A Oh you can make that definition anyway you like but the wastage of gas, you and I may look at it somewhat differently.

Q Didn't we agree that economics was the fundamental basis?

A Then you get into the question of 209,000 and I

[illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A I work [illegible] [illegible]

Q [illegible]

A I work [illegible] [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

brought that whole question up, that after a well, the disposal of this gas gets to be a more expensive problem than the crude oil is worth.

Q Do you consider or do you not consider that well to to be a gas well?

A Oh I would consider it to be a gas well.

Q And you use it in your interpretation of the oil field, did you not?

A "Interpretation of the oilfield", would you mind explaining what you mean by that?

Q Well you use that well as a criterion in judging what wells in the areas "A" and "B" would do, did you not?

A Oh yes.

Q And yet under your own admission that is primarily a gas well?

A I think it would be now.

Q In other words then in your own mind there is some connection between the gas and the oil areas, is there not?

A Now you go to areas instead of considering wells, that is a difference again.

Q We will put it in terms of wells then, in other words in your own opinion there is some connection between the gas wells and the oil wells?

A Some connection?

Q Yes.

A Within this quarter mile limit almost decidedly.

Q You used area "A", did you not, in determining your fundamental information for the development of your oil reserves.

[illegible] as well,
the [illegible] more
[illegible]

Q. Do you [illegible] it
to be a [illegible]

A. Oh I would [illegible]

Q. Are you [illegible]
[illegible] did you [illegible]

A. "Interpretation of the [illegible]" [illegible]
[illegible]

Q. Will you [illegible] a [illegible]
[illegible] "A" [illegible] do, did you [illegible]

A. Oh yes.

Q. Are you [illegible] [illegible]
[illegible]

A. I think [illegible]

Q. In other words [illegible] there is some
connection [illegible] there not?

A. Now you go [illegible] [illegible]
[illegible]

Q. [illegible]
[illegible]

A. [illegible]

Q. [illegible]

A. [illegible]
[illegible]
[illegible]

A I didn't determine it, the wells determined it.

Q You used area "A" in that determination?

A Yes.

Q Did you consider any of the gas wells within a mile of area "A"?

A I gave the life history of Highwood-Sarcee No. 1.

Q Did you include that in your estimate of the reserves in area "A"?

A No.

Q And yet you just got through saying that a mile's influence would affect it.

A A mile's influence, a quarter of a mile.

Q Did you say a quarter of a mile, would that not throw you into the gas area?

A You see this, that is a gas well, and what is an oil well is bound to be an arbitrary decision. Now let us get back to what really I did and the question you asked me with regard to Century. I took the pressures down to zero and I figured it out as if with those pressures they would keep on producing at the October gas-oil ratio, that it would not keep on producing, that it would level off at that rate and keep on constantly to the end of the lifetime, which is obviously the maximum figure, that is what I actually did. Now all these questions about Century, I qualified that by saying I figured it was the maximum figure for the following reasons, one of which was that Century and Richland, 2 wells, when they got to low pressure, be the as they may, classified in this arbitrary area which they call the gas well or in

the area which is outside of my crude area "A", nevertheless they give an indication of what might happen to wells in this crude area "A".

Q Pardon me?

A That was qualifying factors.

Q Would the Court's Reporter read that last statement of yours, just the last sentence.

(Reporter reading) "I qualified that by saying I figured it was the maximum figure for the following reasons, one of which was that Century and Richland 2 wells, when they got to low pressure, be they as they may, classified in this arbitrary area which they call the gas well or in the area which is outside of my crude area "A", nevertheless they give an indication of what might happen to wells in this crue area "A" ".

Q DR. BOATRIGHT: Nevertheless they give an indication of what may happen in this crude area "A", did you consider the gas area when you estimated your reserves in area "A"?

A No.

Q And according they do give an indication of what is happening there?

A These two wells do, yes.

Q And are these two wells anywhere near area "A"?

A Quite so.

Q How far are they?

A Now we will have to get----

Q Just roughly, a mile or a quarter of a mile or half a mile?

A Oh it is within a matter of feet, it is perhaps----

Q Never mind, and yet you did not take this into consideration in calculating your reserves, did you?

A No.

Q So much for that, now at the time---

A Do you wish to consider this question of Sterling No. 3 which is also there?

Q Where is that well located, is this the well here, Sterling Pacific No. 3?

A That is right.

Q And is that not what Mr. Link defined as the gas-area?

A No, that is in our crude area "A".

Q Are you sure of that?

A Positive of it.

Q It is right exactly on the contour line between the gas and the oil area?

A I think in this case it is known, in due course we will call Dr. Link and he has more information, he was there when that well was surveyed and he knows exactly where it is.

Q You have this map, this map to show, in your own report.

A As I have taken Dr. Link's information, he is the person who decides that.

Q All your information is based on Dr. Link's report?

A Yes.

Q And you have assumed that he is 100% correct in all your analysis?

A Yes.

Q Is not Sterling Pacific 3 then right on the dividing line?

A As I say again---

Q Between the gas-cap and area "A"?

A As I say the position of that contour line should be checked with Dr. Link as he knows where the bottom of the hole is regardless of where it is at the top. I think you will find unquestionably when the information is produced that it is definitely in the crude area, if not in the 2000 foot contour line, I think it is just above the 2000 foot contour line as I mentioned.

Q So far as you know though and based on your own information that is right on the gas area contact, is it not?

A No, it doesn't happen to be, I know that.

Q It doesn't happen to be on this map of yours?

A You are looking at the surface of the well location.

Q Yes.

A Well I am talking about where the well ended up down below.

Q You know where the well topped that lime?

A Dr. Link will give you all that or can give you all that.

Q So far as this map is concerned on the surface, that well is exactly on the gas-oil contact line?

A That is quite right.

Q And so far as you know it may be either side of that line, down in the formation, might it not?

A No, I know where it ended up that is all.

Q Where did it end up?

A I would prefer, the actual information is Dr. Link's information and I am taking his.

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q [illegible]

A [illegible]

Q You said you knew exactly where it ended up?

A I have got it from Dr. Link, Dr. Boatright.

Q Then you on your own information do not have it, is that correct?

A That is correct.

Q All right, now then---

A The main thing I want---

Q How far off the horizontal projection of the top of the hole does the ordinary hole run in the Turner Valley Field?

A That again Dr. Link has and it is all, it is not information which I have seen, Dr. Link has all the information about the wells which have been surveyed, I think some nine or ten wells and he is the expert who knows exactly the results of the directional survey.

Q Would you say the average distance is 100 feet or 200 feet or 300 feet?

A No I do not know.

Q You have no idea?

A I have an idea but I do not know.

Q What is your idea?

A One well, it varies with the well, one well I know which was surveyed and I know the result, it was twenty-one feet off but there is no particular point---

Q In other words supposing this well was as crooked as that one you know of, it would be still within twenty-one feet of that line?

A Well that happens to be a crooked well. It has been surveyed.

Q Nevertheless the fact remains with that Sterling No.3

it is right close to the gas-cap, is it not?

A We will say the 1900 foot contour, if you want to get, it is near the 2000 foot contour as I recall Dr. Link's statement.

Q Nevertheless it is close to the gas-cap?

A Yes, it is on the east side.

Q And what are the characteristics of the production of that well when the well came in? was it primarily a damper or primarily a crude oil?

A All crude oil.

Q And the gravity?

A That I cannot tell you.

Q What was the gas-oil ratio, have you that information?

A Yes, I have that.

Q What was it?

A Page 40 , my Lord, Sterling Pacific No. 3, the first month's production was 2969 barrels and 3,770,000, we have to divide that, 12.7, that is near enough.

Q 12.7 thousand cubic feet per barrel?

A Yes.

Q When was that taken?

A That was in January 1937 and incidentally now I can give you that bottom-hole pressure which we considered yesterday, and which is related to this.

Q That bottom-hole pressure will not give you any information of gas-oil ratios because you do not know the relationship between gas-oil ratios and bottom-hole pressures, you have not worked that

out yet?

Q With which?

Q The change per hundred pounds?

A I can give you the facts, and it would be the basis on which I would work it out, the measurements, this is one of those wells which was drilled in an area where the pressure was already partly down and it affects the gas-oil ratio at which the well started to produce. Inother words it had been interfered with. I will just read that, to complete the answer, in May 1937. I think it is in the body of my report, May 18th, 1937 was 1150 pounds.

Q Did I understand you to corelate that with Century 3 on the basis of 300 pounds?

A I want to describe what was happening in the well, that was the point, in January or in November of this year Sterling 3 bottom-hole pressure October reading was 635 pounds. Therefore it is getting down in pressure and in the month of November----

Q What was the gas-oil ratio in that month?

A Now I will just work that out.

Q Didn't you have these gas-oil ratios worked out in arriving at your figure of reserves?

A They are all in here you see, they just have to be worked out that is all but we use the gas-oil ratios, now in October the gas-oil ratio for Sterling No. 3, 29,000, 29.6.

Q Now then----

A Just may I complete my answer, Dr. Boatright?

Q Quite right.

A This well now shows the beginning of the tendency

for the crude oil production to drop at a more rapid rate and we have not yet reached the point where it has just completely gone to pieces but it has reached the point where the indication is that it is following the same history as Century and Richland No. 2.

Q Coming to these gas-oil ratios then, I take it, in working out these figures, that you did not take the gas-oil ratios throughout the life of these wells, you merely took averages over certain periods of time, didn't you?

A What I have taken is the averages over monthly periods.

Q And did you include all of the months from the time the well came in until the present time?

A Yes, every month.

Q And do you have any idea of the relation between the gas-oil ratio at any given rate of production and what the gas-oil ratio would be at any other given rate of production or any particular well in the field, did you make a study of that?

A We have considered that matter. Now I am not just sure whether we have some graphs showing some actual figures. They are not in the report. The data is in the report.

Q In what way did you consider the data?

A Well Davies No. 2 is an example for it has a very good record and the rate of increase of, just a minute until I give the correct page here, it is page twenty-seven, the rate of increase of gas-oil ratio and the plotted against the drop in bottom-

hole pressure. Now you will note that I take an average figure for Davies No. 2 in October in calculating what would be left in the ground. Now I could have done it in much more detail and carry that plotted figure out as the bottom-hole pressures went down and gas the gas-oil ratios go up.

Q I think you missed the point I am making entirely and it is this, you can go to any given well on any given day and you can change that bottom-hole pressure, can you not, we went all through that yesterday?

A That is right.

Q Now in making your estimate on the basis of gas-oil ratios did you take a single well and determine the actual gas-oil ratio, the characteristics of that well at any given day?

A I didn't take any given day, it is quite inaccurate to do so.

Q In other words you have no idea of the relationship for any well in the field between the gas-oil ratio and the actual rate of displacement in the reservoir, do you?

A Yes, the gas-oil ratio and the actual rate of displacement from the reservoir?

Q Yes.

A Your statement was that I had no idea of that at all.

THE CHAIRMAN: You are asked that question.

A I am asked that question, no. The gas-oil ratio and the actual rate of displacement.

Q In other words then you have simply taken the rates of flow as they have happened to occur and under your own statement those rates of flow will vary every day, for the well?

A Now let me qualify---

Q Just a minute until I have finished the question, if the gas-oil ratios were excessive, then you take those figures without knowing anything about whether those gas-oil ratios were representative of these minimum gas-oil ratios in horizon, and you applied them for your whole total estimate, didn't you?

A May I answer now?

Q Yes.

A When I said that they were badly, the wells were badly operated, I did not mean that every Well in Turner Valley was badly operated. For instance the Royalite Wells were quite properly operated. There are other companies which quite properly operate their wells.

Q Would you say that the field was or was not properly operated as a whole?

A I will just give you the facts. The Royalite quite properly operates their wells. I do not see where they could have operated them in my judgement in any better manner. There are other companies which operate their wells very improperly, terrible in fact as I expressed it yesterday. Now we went into the question that an inproperly operated well will affect a properly operated one.

Q Did you check into any of the wells to see whether or not they were properly operated as respects to gas-oil ratios?

A Oh I am quite familiar with the operation.

Q What was the relation between the various rates of flow and the gas-oil ratios in some particular well on any particular day?

A I am not concerned with any particular day and the actual rate of operation. These wells, Dr. Boatright, are operated quite consistently day by day by the Royalite. Now we have a property across the road----

Q Now right there----

A Wait until I finish my answer, we have a well across the road which will blow its well for three hours and shut it in the rest of the day. Now when that well is opened after being shut in we will say for twenty-three hours, I will give you an exact case here, one well will produce 91 barrels in twenty-four hours by blowing it for an hour and a half but to produce 291 barrels it has to blow the whole twenty-four hours. That happens to be an actual case. Now to take the gas-oil ratio of one of those wells which is shut-in part-time and then blown, you do not get any record or any idea of what actually is taking place there at all. It is very inaccurate. What I have done is that I have taken the production for the month of October of natural gas, the total, and the total of number of barrels of oil and that is the amount of gas required to produce so many barrels of oil.

Q Are you sure?

A Yes.

Q Now the question was do you or do you not consider the field as a whole to have been operated throughout its life at its optimum gas-oil ratio, you have cited all these instances and now all I want is your opinion based upon all these wells, I do not care about the individual history of a well.

A The field as a whole was it operated at its best gas-oil ratio?

Q Yes.

A No.

Q Well you took the field as a whole in the oil areas. Well you take the admittedly poor gas-oil ratio figure then, do you not, because your fundamental figures are based on the gas-oil ratios during the time that that field was being imperfectly operated?

A Correct.

Q In other words those figures are wrong?

A No, they are the facts.

Q They are the facts?

A I want to answer this question if I may.

Q Let me finish the question.

A All right.

Q In making your calcuation?

A That is right.

Q You used the gas-oil ratios of the field as a whole during an admittedly poor period of production of the field's life, those gas-oil ratios then were admittedly high and therefore are not truly representative of the actual sub-surface condition. Now is that not correct?

A Yes I think that is correct.

Q Well then your estimate is not good, is it?

A Perfectly good. Dr. Boatright, may I now complete my answer?

Q THE CHAIRMAN: Go on.

A It is impossible to go back and put th s area back to where it was in June of 1936 and the facts are that the bottom-hole pressures are as stated and the gas-oil ratios are as stated and the estimate of the reserve in that area then will be based on the utilization of that energy which is now left in there, regardless of how it was operated in the past.

Q But in arriving at your final conclusion you use as fundamental figures some figures which you admit are not truly representative of the bottom-hole conditions.

A I quite agree with you that if you, and I modified one of the modifying factors, that if you put pumps, I do not know exactly the effect it will have, but when these wells came in on the West side they put pumps on them, of certain types, we might increase the rate of decrease the rate of decline of these bottom-hole pressures.

Q In that event then your figures would not be complete?

A In that event my figure of oil left in the ground in area "B" we will say could be increased, that is right.

Q I think we have covered that subject rather thoroughly. On page six in your report in the second paragraph and the second line you make the statement as follows:

"Under high pressure, natural gas enters into solution in crude oil in part, and in part form complex hydrocarbons".

Will you explain to me what these complex hydrocarbons are?

A I do not know. What page is that incidentally?

Q That is on page six.

A No, I do not know.

Q You do not know what they are?

A No.

Q Have you ever had any experience with them at all?

A You mean in determining what they are?

Q Yes.

A No.

Q Is it your idea that a chemical reaction goes on down in the reservoir which forms different hydrocarbon from those which come to the surface?

A It is a very, all the reading I have been able to do, that it is a very complex subject and the most recent work does not give anything very definite.

Q All of your information then comes from reading?

A That is it.

Q Just what you have found out by reading?

A Yes.

Q And you do not know what the complex hydrocarbons are and you do not know whether they are complex hydrocarbons or just simply mixtures of hydrocarbons?

A They may be mixtures.

Q So that expression has no meaning so far as that

particular statement is concerned?

A It may not and on the other hand it may.

Q In other words you are not sure about it?

A I am not sure of it.

Q Let us turn over to page seven of your report, the last line.

A In that last answer, there is no question about it going into solution, I am quite satisfied about that.

Q But you do not know whether it forms complex hydrocarbons or not?

A No, or what they. I read that such have been formed synthetically.

Q But you do not know anything about it?

A I did not do the experiment.

Q In the last line of the first paragraph on page seven you say:

"And we have what is known as 'retrograde deposition' or in naphtha areas 'retrograde condensation'".

Does that paragraph represent what you understand by "retrograde condensation"?

A In the sense used in this report, yes.

Q You know there is an accepted term called "retrograde condensation" in the oil industry and it has been used for the last seven or eight years, is this the same thing?

A We will just leave it so we will not get into a dispute about it. I defined what I intended to convey by the word "retrograde condensation".

Q "Retrograde condensation" is an accepted term and has a reference to a very particular phenomenal whose laws and actions are well understood by a number of men in the oil industry and what you call"retrograde condensation" there does not conform to that definition.

A That may be. I will admit that.

Q You would not say that this "retrograde condensation" term means what it says?

A I will say in the sense I have used it in this report.

Q These are merely wordwhhhch you appoint to designate a particular thing you are talking about there?

A That is quite right.

Q Whether or not they correspond with the general accepted view of "retrograde condensation"?

A That is right.

Q Now in the third paragraph of that same page you say:

"From the results obtained in Okalta No. 6 we now know that we do not have an effective water drive from the West".

A That is right.

Q Will you please give us the benefit of your experience of that so that we may know how you arrived at that interpretation?

A Well the rate of rise of the column of liquid in Okalta 6 was quite slow. We could not unfortunately fix it and the rate of travelling water in, 65 barrels a week is my information as to the amount of water that came in.

Q That is merely a report?

A Well that is all the data there is available.

Q In other words there is not enough information there to say definitely one way or the other?

A Well you can definitely say this that there was not a high and rapid rate of water travel.

Q At the bottom of that same page you say:

"In the case of naphtha, the critical pressure is something above 1100 pounds. In the case of heavier hydrocarbons such as crude oil, the critical pressures run up to, and above, the maximum pressures found in Turner Valley which is 2660 pounds to-date".

A Now again I use those expressions as defined.

Q Now is it your idea of your critical pressure as you define it, that that is a particular point?

A I think with each particular fraction it is a different point.

Q And how many fractions are there in the oil and gas in Turner Valley?

A A good many.

Q Well it is no definite point?

A No.

Q And it may range all the way from zero to 2660?

A We noticed in operating the naphtha wells and that is what I have a particular record of, it is about 1100 pounds.

Q For your information that is the pound probably about which your retrograde condensation occurs and that is the thing that explains that?

A Thank you.

Q On page eight:

"In the case of crude oil wells, Davies No. 2 is enlightening. At the beginning of its history, the bottom-hole pressure in this well was at least 2300 pounds."

I am reading from his report:

"After producing 100,000 barrels it was 1770 pounds in November 1937. Towards the end of the record, the bottom-hole pressure was 1145 pounds. October bottom-hole pressure was 1180 pounds".

What was the average per acre recovered from that particular well?

A I do not know the acreage, that is my difficulty.

Q You do not know the acreage?

A No.

Q Is it your opinion, Mr. Davies, that unless we have an absolute measure of all of the sub-surface conditions that no reliable estimate can be made?

A In the basis, you mean make a reliable estimate on the basis of the amount of oil down under ground.

Q You cannot take a field such as Turner Valley with production at one end and production at the other end and no definite information that is absolutely conclusive, and assume, make a reasonable assumption as to the amount of that area in between which is saturated with oil when it is on the same structure, is that your opinion?

A My opinion is that that is substantially correct, yes.

Q Did you know that throughout the United States for the last twenty-five or thirty years as a matter of fact,

even back as early as 1900, that engineers have been doing that and just recently the American Petroleum Institute and several other organizations made an estimate of the potential reserves in the United States and that their figures

ch check within very close limits and that they were all independent calculations and that everyone of the calculations practically involved an estimation of the amount of available oil land in each individual field in the United States.

A I will go further and say that I quite agree with that but can you give me one example, I will ask you a question if I may.

THE CHAIRMAN: No.

WITNESS: I may not?

THE CHAIRMAN: You can say anything you like but you cannot ask a question.

WITNESS: Very well, my Lord. I do not know of any.

THE CHAIRMAN: You can make any statements you wish of course.

A I do not know of any field that has been so estimated similar to the conditions which we have in Turner Valley.

Q Have you ever worked in any other line of field?

A The only experience I have had is such wells as we have drilled in Montana.

Q How many was that?

A Oh that I personally have been interested in and lost money on mostly all of them, about a half a dozen, but I have the information of a great number surrounding them

Q What did that association with these particular wells consist of so far as you were concerned, were you in complete charge of the wells and actually on the ground or just here operating out of Calgary and having the wells drilled down in that area?

A Oh a number of us had the bright idea that we could get oil down there and I went and had something to do with them.

Q How much actual time did you spend in that field?

A Oh a fair amount.

Q How much?

A I cannot say how many. I would say offhand, all told six months.

Q How much of that time was spent actually in the field?

A I mean six months actually spent in the field.

Q What field was that?

A The Kevin-Sunburst and to the west of it.

Q Is that a pure limestone field?

A Yes, that is limestone.

Q And have you had any other experience in lime fields?

A No, just wait a minute, I have to go back. Mexico six months, grand production, all from limestone, water-drive, everything that could be worked out beautifully.

Q What did you do in Mexico?

A I was there in a minor cast of being tool dresser, nevertheless I was there to learn all I could.

Q You didn't have any access to the records of the production?

A Oh yes.

Q Or the future of the field as a whole?

A Yes, I did very much because I was there rather as a young man learning the business.

Q Have you had any other experience with limestone areas?

A No, I think that is all.

Q I think your statement was that as far as you knew there were no other fields exactly like Turner Valley?

A I think that is still correct. We have an association of the, the American Association of Petroleum Geologists and I believe every field of any size is described in it.

Q Do you know of any two identical fields in the world?

A No, I would not say that I do. I know of many conditions such as sand fields that are comparable though.

Q Are you familiar with the Border field in Texas?

A No.

Q That field happens to be very similar to Turner Valley, so that it is not unknown to have a similar field although it is not identical of course, but nevertheless the fact remains that any number of reputable, reliable petroleum engineers have made estimates of a field where the outlines of the field are not absolutely determined by the directional?

A That may be correct.

Q It would not be against the ethics of the profession

to make an estimate of the reserves?

A I am not suggesting that.

Q It is done every day.

A But I am questioning the accuracy of it.

Q Do you have any knowledge of any field where the estimate is made on the basis of future developments which only takes into consideration the actual wells which are actually drilled?

A I have made some myself. I made one in Trinidad on a problem much smaller, if I may outline it, much smaller than this, it is a territory in which the lenticular sands vary through some thousand foot thickness of formation.

Q I think the information that you have done it yourself is sufficient. Do you know of anyone else who has done it?

A Yes.

Q In what instances?

A There was a particular problem of an estimate of the gas reserves in Turner Valley in 1931 and I think all three of us, who estimated used the same basis.

Q As a matter of fact you used the figure 10,000 acres? then, didn't you?

A I have the actual report here and can give it to you.

Q You remember the figure 10,000 acres?

A I believe it is in that neighborhood.

Q And as a matter of fact Mr. Link's figure is now only some 7,000 some hundred acres?

A I had better look it up.

Q You know it is about 700 acres, don't you?

A Slightly.

Q Some 700 acres over 7,000 acres?

A You see that is Dr. Link's Division?

Q You don't remember that?

A Which?

Q That it is something over 7,000 or between seven and 8,000 acres in his report?

A I would like to look it up and be sure, something around that.

THE CHAIRMAN: If you are referring to a report let us have the report.

A This is the report on the reserves, on the acreage in 1931, 9980 acres.

THE CHAIRMAN: This has to do with the inquiry of which you spoke?

A Yes, this is a copy of the report.

Q DR. BOATRIGHT: Now that estimate there is greater than Mr. Link's estimates as of now, is it not?

A Yes, it is.

Q It is?

A Yes.

Q Now is that area then all well drilled out?

A Now let me look and see. You see some of this area was thrown out by wells.

Q Then you did estimate some acreage which was not absolutely proven in that particular estimate?

A Well we will see now, that map is right here.

Q Your statements that they threw some acreage out because it was dry?

A Just a moment. Yes I think that there were some dry holes drilled in the area that I concluded in the

estimate.

Q In other words then you did estimate some additional acreage in making that particular estimate?

A What do you mean additional acreage, I took it on 9980 acres.

Q And as a matter of fact there are not 9900 acres in Mr. Link's figures which you accepted, which are productive of gas, truly gas produtive area?

A No, that is correct.

Q Then you did estimate on a basis of performance, some additional acreage which could be reasonably assumed in calculating the gas reserves at that time?

A Yes.

Q Did you do that in the case of the oil in the particular estimate you have made here?

A I have estimated here the amount of oil remaining in the ground in area "A" and in area "B".

Q But you failed entirely to give us the benefit of your idea of the probable productive acreage of the field, didn't you?

A That acreage, I accepted Dr. Links. What I intended to give you was the figure, how many barrels an acre that it might produce.

Q Then you think it is very probable that the area given by Dr. Link is correct and that will be oil productive?

A That is the part I do not know, it depends on drilling.

MR. FRAWLEY: Before you leave that, Mr. Davies, what report is that you have in front of you?

A This is the report of the gas inquiry in Calgary which I made for the City of Calgary, appearing for them, in May 1931 I believe.

MR. FRAWLEY: I think you had better, if you do not mind, Mr. Davies, file that with the Commission together with the map which accompanied it so that the commission will have the benefit of any other studies which have been made in this connection.

A This is the one and only file copy that I have left. I will put it in a proper cover. Is there any possibility of me getting the copy back?

MR. FRAWLEY: I think ultimately when this is finished.

THE CHAIRMAN: I think undoubtedly so.

WITNESS: Because otherwise I have not another one but I will put a proper back on it, it is just tied with string now.

(REPORT PRODUCED BY MDR. DAVIES HERE MARKED AS EXHIBIT 20)

THE CHAIRMAN: We will now take a five minute's recess.

(Five minute's adjournment)

DR. BOATRIGHT: I believe we were talking about Davies No. 2 and had gotten some information regarding the drainage area and I believe that during the progress of this investigation it has been your opinion that probably a quarter of a mile at the outside represents the drainage that is possible?

A I think so.

Q Even in the gas-cap?

A I think so.

Q You mention some reports, I have one here, an affidavit made in the matter of certain orders of the Petroleum and Natural Gas Conservation Board pursuant to the provisions of the oil and gas Conservation Act, 1938 and in the matter of Mercury Oils Limited, Applicant, and the Petroleum and Natural Gas Conservation Board, Respondents, at what time was that affidavit made, Mr. Davies?

MR. NOLAN: If you will just look at the end you will see the date.

Q DR. BOATRIGHT: This is made on the 5th day of October, 1938, is that correct?

A That is correct.

Q I am reading from that affidavit:

> "After the setting in of the gas wells, the gas from the wells in which the flow of gas has been restricted under the said proration order of August 31st, 1938, will slowly migrate under ground into the crude area when the reservoir pressure in the crude area is lower than that in the gas area, and here, due to lower reservoir pressure, will rise through the crude wells which are being allowed to flow without equal restriction. This gas from the gas wells when it flows through the crude well, will do so at such low

reservoir pressure that the oil present in the formation will be by-passed and left in the formation".

Is that correct?

A Correct.

THE CHAIRMAN: Just what is this?

MR. FRAWLEY: Purely what the witness found in his statement made at that time. We are perfectly willing to offer it as an exhibit if you wish. It is part of a court file.

THE CHAIRMAN: I think if you are reading a part of it into the record the whole of it should go in.

MR. FRAWLEY: Yes. We might have it copied and file a copy.

THE CHAIRMAN: Yes.

(AFFIDAVIT SWORN BY THE WITNESS STANLEY J. DAVIES ON THE 5th OF OCTOBER 1938, HERE MARKED AS EXHIBIT 21).

THE CHAIRMAN: Now under what circumstances was exhibit 20, the previous exhibit, made if I might ask?

A It was at the hearing before the Board of Public Utility Commissioners for the purpose of---

Q Do you remember when?

A May 1931.

Q Was there a report consequent upon that?

THE CHAIRMAN: A report of the Board?

MR. FRAWLEY: Yes, Mr. Chairman, and Mr. Morrison is going to tell you he is going to make some reference to it. I have certified copies of all the

[illegible]

[illegible]

[illegible]

orders made by the Board in connection with gas rates for the Province of Alberta and I intend to file them and call attention to them.

MR. NOLAN: As I understand, this was an application to the Board to fix the base rates for gas.

MR. FRAWLEY: Not to fix a base rate but to fix a rate.

THE CHAIRMAN: That has been marked as Exhibit 20 then and this affidavit which is being produced now will be exhibit 21.

MR. FRAWLEY: I can describe this to you, it is an affidavit of the witness in a certioria matter in re: Mercury Oils and the Conservation Board and from the durat it was sworn on the 5th of October, 1938.

THE CHAIRMAN: All right, Dr. Boatright.

Q DR. BOATRIGHT: Then as late as two and three months ago you were under the impression that there was a possibility of gas migrating down into the oil area, were you not?

A All subject to this quarter mile because a lot of these wells were within a quarter of a mile of each other.

Q Still in your estimate you did not take that into consideration at all?

A That the gas---

Q In your area "A" you did not consider the gas area at all in the estimate you have presented here?

A No.

Q Now coming back to Davies No. 2 and considering that matter, in your estimate didn't you give a figure

amounting to 6555 barrels per acre?

A That is correct.

Q How did you arrive at that figure?

A That is made up of, page 50, Mr. Commissioner, 3112.6 barrels per acre produced from area "A" of 1670 acres, this production was to October 31st, 1938.

Q How did you arrive at that area?

A That was taken from Dr. Link's geological work as to the outer edge of the crude area at the minus 1700 foot contour and down to the minus 2600 foot contour, an area in which the pressure, due to this quarter mile factor again, had been partially depleted before the wells were actually operating.

Q And that depleted area was the foundational basis for your report, was it not?

A Yes, incidentally that depleted area also applies to the whole of the west flank of Turner Valley in which we have Advance 5-A and we have taken that into account and the Model wells in the north end which we took into account.

Q And I think you made a statement which I am sure you did not mean to make, that it included the total area between the 1700 and what other contour?

A Minus 2600.

Q Yes, you only took in the area surrounding the wells in the area, you did not take that whole area across the field, I am just trying to correct a statement which you made.

A You mean on the surface of the limestone?

Q Yes, in other words you just took this little area in this area, plus other little isolated areas.

A You mean in the whole field?

Q Yes.

A Oh no I didn't, just in the proven areas as shown in Dr. Link's map.

Q I just wanted to correct that for the sake of the record, thanks very much. Now in determining that figure of 6555 barrels per acre which you use, you then divide the total amount of oil which you figure that acre would make by the number of acres, didn't you?

A Yes, that is right, I didn't quite finish that answer. I gave 3112 as being produced. Now I take it you are going through the whole answer, do you want me to complete the answer of how I did it.

Q The point I am trying to make is this or the question I am trying to ask you is this, how did you arrive at that per acre figure unless you in some way or other calculated the drainage area around the well.

A Well I took---

Q You may not have taken it by individual wells but in fact that is what you did when you divided the total production to be obtained in that area by the number of wells.

A Yes, that gives the average.

Q It is equivalent to assuming the figure which I believe is---

A 46.6 acres.

Q 46.6 was for the whole area?

A Yes.

Q Then coming back to Davies No. 2 I asked you about the total amount of production which that well has made since November, 1937, and you gave that and if we assume that that well had 46½ acres, which is the average?

A That is right.

Q And that would give you the figure for oil recovery from that well, would it not?

A Yes.

Q In other words that is a reasonable basis, and what is that figure?

A Assuming the 46.6 acres?

Q Yes.

A May I figure this out now.

Q That is a reasonable assumption, is it not?

A For that well, yes, I would think it is. I just do not know, you know, that is the average for that whole area but I am perfectly willing to assume 46.6, that is the average for all.

Q That would give you how many thousand barrels per acre produced in November 1937?

A Just a minute now.

Q To save time do you have the total production to date?

A Yes, 39359 barrels.

Q Then would you mind figuring the total production per acre to date from Davies No. 2, assuming that it drains 46½ acres?

A Yes, 8800 barrels odd, do you want it---

Q Is that right?

A I may be wrong about this, I will do it over again.

Q I guess that is right, that is all right, that has been produced to date?

A That is right.

Q And that is in that area "A"?

A That is in area "A".

Q And during that time that well was producing do you have the figure of the total amount of gas which was produced?

A Yes, 932,702,000 cubic feet.

Q Do you also have the bottom-hole pressure at the present time?

A Yes, 1180 pounds.

Q Do you have the initial bottom-hole pressure?

A 2300 is the pressure we took but it is based on the 1770 and the pressure measured in an adjoining well within a quarter of a mile. Now just a minute until I look that up, this is where we arrived at these original pressures and I will illustrate how careful we have been.

THE CHAIRMAN: Mr. Frawley, while the witness is looking this up, I take it that you are accepting the data which Mr. Link furnished to the witness upon which he has predicated some of his conclusions?

MR. FRAWLEY: That is accepting it?

THE CHAIRMAN: Yes.

MR. FRAWLEY: May I consult Dr. Boatright?

THE CHAIRMAN: Yes.

MR. FRAWLEY: I wonder would it be well if we came to a considered conclusion about that and gave you our view after the noon adjournment?

THE CHAIRMAN: Yes, so far as there is no reason to have doubt as to its accuracy, that may be saving a great deal of trouble and expense.

MR. FRAWLEY: Yes.

THE CHAIRMAN: Of course if you have doubt about it you will certainly not accept it.

MR. FRAWLEY: That is true.

WITNESS: I think I have to go back to Dr. Link's bottom-hole pressure now.

Q DR. BOATRIGHT: Did you do that?

A It is here some place, that is how I did it in the first place.

DR. LINK: On this graph two months after the well came in there is a pressure reading of 1760 pounds, the figure on page sixteen in my report, that is just two months after it came in.

Q DR. BOATRIGHT: Was that measured with a bottom-hole pressure instrument?

A Yes, that is the bottom-hole pressure, that is one of the first we had and that was shut in for twenty-five hours.

Q In your calculations of original bottom-hole pressures did you arrive at any oil increase in the bottom-hole pressure per 100 feet of depth below a certain datum plane?

A Yes, there is.

Q What is that?

A It was either 36, I think it was near the figure you gave, 36.

Q Is 36 satisfactory to you?

A Yes.

Q Then originally the bottom-hole pressure in Davies No. 2, I understand it was drilled fairly early?

A Yes.

Q It may have been the equivalent pressure to 36 pounds per 100 feet of depth below the surface elevation of 4000 feet?

A Do you want me to answer that?

Q If that is satisfactory, I believe that will be satisfactory for our purposes?

A Yes, I think it is.

Q We may disagree in the decimal place. Then the present bottom-hole pressure was what figure?

A 1180. Incidentally I want to bring out the point here that was so much stressed by you yesterday with regard to these pressures going up and down. It is somewhat like a roller-coaster, my Lord, it is up and down but finally you come down on the roller-coaster, so you do on this and the percentage in this is rather interesting, in this particular well, the bottom-hole pressure, just so it does not leave the impression with the commissioner that this is not a great amount of variation on the average in the well. Davies No. 2 was measured in October of 1140 pounds. In September it was 1145 pounds. In November it was 1180 pounds. Now that is an increase of forty

pounds. In 1140 which is 3.5% and I want to give you an idea of the amount of variation when they restrict the production against any particular well and this is one of the wells, Dr. Boatright, that I would think has been handled in as efficient a manner as it is humanly possible to handle an oil well. It is under the control of the Royalite, has been from the beginning and I know of no better method of handling it than they have.

Q I do not think that question is involved here at the present time. If we take the original bottom-hole pressure which we will assume is 1760 pounds?

A The original bottom-hole pressure?

Q Yes, which was 1760 pounds I understood from your testimony?

A 2300 we took.

Q Oh, 2300.

A 1770 was measured after it had produced.

Q I see. Then will you calculate what you think the original bottom-hole pressure was, will you do that, you assumed, pardon me, you assume 2300 pounds, did you?

A Yes.

Q All right, let us take that figure, that is close enough, then the present pressure is 1100?

A 1180.

Q And if we take the difference between those two, 2300 minus 1180 pounds, that then means that the average pressure during that period in which the gas was produced would be half-way between those

two, would it not?

A That is right.

Q In other words if we divide the difference between 2300 and 1180, which amounts to 1120 pounds?

A That is right by 2.

Q By 2, it gives 560 pounds and adding that figure of 560 pounds to 1180 pounds, that then gives us the average pressure of that gas in the formation during its life, productive life, is that correct?

A 1740 pounds.

Q 1740 pounds?

A Yes.

Q If we divide 1740 pounds by 15, that would then fairly closely give us the atmospheres of pressure?

A That is right, 116.

Q 116, and then if we divide the total amount of gas produced to date by 116, that would then give us the cubic feet of displacement in that reservoir, would it not.

A That is right. Do you wish me to do that?

Q Yes, I wish you would.

A It would be 8,40,000, I believe that is correct.

Q Now that is the cubic feet which that gas occupied in the reservoir?

A That is correct.

Q In addition to that we have the oil which was in there amounting to 3,93000 barrels?

A That is right.

Q Let us drop the odd figure of 59 and multiply this 393,000 by 5.6, which will give us the cubic feet of oil in that reservoir which has been produced

by that well.

A 2,190,800 cubic feet.

Q 2,190.000, let us drop the 800, adding those two figures together then gives us what?

A 10,230,000.

Q In other words, that figure of 10,230,000 cubic feet represents the actual space in the formation which was occupied by the gas and oil of Davies No. 2.

A Correct.

Q Now if we divide that total figure by 5.6 that will then give us the barrels of space in the reservoir actually occupied by gas and oil, would it not?

A It should, yes.

Q Let us do that.

A 1,826,920, is that right?

Q The figure I obtained was 1,800,000.

A 1,800,000, just a minute until I check this, there is 150 left over.

Q It will not be necessary---

A 1,800,000.

Q Now if we divide that by the even assumed figure of 46½acres that will then give us the barrels of space that was occupied by gas and oil that Davies No. 2 has produced, would it not?

A Yes.

Q Let us do that.

A Near enough is 39,000 is it not.

Q Yes. Now I believe the figures you use for wells in about that same condition was about two-thirds of the total production already?

A Yes.

Q Then in that event you would arrive at about 60,000 barrels per acre, would you not, for that area, which corelates very closely with a figure of 62,000 barrels per acre which I used in my estimate,would it not?

A But oil being down underground in space?

Q I said the actual space to be occupied by oil or gas.

A The only qualification, yes, I agree with that, there is only one qualification, that is the amount of space occupied by the gas in solution in the oil.

Q Which would be a relatively minor thing taken over figures such as these, would it not?

A That is something which should be taken into consideration.

THE CHAIRMAN: Now Mr. Frawley, you said something about some matter you wished to discuss before we adjourned.

MR. FRAWLEY: Mr. Fenerty is here to make an application to the commission, to call the commission's attention to something.

MR. FENERTY: Mr. Chairman, when I spoke to this matter yesterday there was some discussion as to the date when this evidence would be available. In the interval I have had an opportunity of making some further investigations and I am in a somewhat difficult position. The fact is that while part of this evidence, one of the experts whom we will call will be here next week, can be brought here next week and complete his investigation. The other

authority referred to we find it will unfortunately be impossible to obtain his services here to complete his investigation involving his estimate, in less than ten days or more in time, to present that evidence, and it will be impossible to do so before the 15th of January. I know the commission is anxious to avoid further delay.

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THE CHAIRMAN: It is a question of whether or not your witnesses can dispense with the doing of other matters in the meantime, or whether this Commission will sit around, and wait for them. We prefer the first of course. I have made inquiries from Mr. Frawley as to how long it took Dr. Boatright to be able to make the estimates that he has, and that took a period of twelve days, exclusive of Sundays. I do not know why your experts should take longer than that, nor why they should not go to work at once. This Commission is now waiting on witnesses. We are here to hear everybody, we want to hear everybody, we want to give them every opportunity to be here, but we do not propose to adjourn every time a witness says "Well, we do not think we would like to go on for a month".

MR. FENERTY: I quite appreciate that position, but my position is simply this, that it might be said of course, that any of the Companies desiring to be represented have had full notice of the sittingx.

THE CHAIRMAN: Quite so, and you might very reasonably expect that the subject you are now concerned with would be entered upon at once.

MR. FENERTY: What is quite so but the fact remains that a situation has developed before this Commission which is certainly of the utmost importance, general importance, to the industry as a whole and the Inquiry as to this particular phase of the pipeline has led to a situation which does affect the entire Turner Valley history and the possibilities of the future. Now, in extenuation of my client's position

I would suggest this.....

THE CHAIRMAN: Why don't you put your witnesses to work now, Mr. Fenerty? You are telling us that some time next week somebody may come here

MR. FENERTY: This is the position, it is not possible to procure the services of authorities of the weight of the gentlemen who have already given evidence, international authorities, I might say, at a moment's notice. Until two days ago our position was that we had available the evidence before the Tariff Commission of Mr. Le Sueur, in fact adopting the evidence of Mr. Spratt dealing with reserves and the acre productions and those figures were at that time assumed to be reasonably accurate, apparently being agreed upon by all concerned as approximately correct, and so far as we knew, until two days ago for the first time evidence was presented to this Commission involving a reduction of the possible contents of that field from 125,000,000 barrels to 25,000,000 barrels, per acre production of from 23,000 barrels to 7300 barrels. Now our position and the position of perhaps other organizations, is that it is not possible to obtain the services of authorities whose evidence would be entitled to weight similar to that of the gentlemen who have given evidence, at a moment's notice. It is possible to obtain them, to come and make an examination, but it is not possible to get them within a day or two, and I quite appreciate that if the Commission feels that its work will be so impeded that they cannot give us that time to get them, we will have to do what we can, but that is our situation.

It is not a matter of consulting our convenience. We used every effort to get them but we are confronted with the situation which arose, I think I am right in saying that, two days ago, and not before, and we just cannot get the evidence that we want to present until that time. Now that is all I can say. This is not a matter of convenience. It is a case of an impossbility.

MR. FRIELLY: Well, Mr. Chairman, as I said yesterday, I certainly agree with Mr. Fenerty, that the people he represents were told for the first time what the opinion of the Royalite Oil Company was with regard to the potentialities of Turner Valley, and I suppose they simply assumed, while they had plenty of notice of the Inquiry and what was to be gone into, I presume that they, as Mr. Fenerty now says, they had the right to go to the record of Mr Le Sueur in his statement of last February, not many years ago, but last February to the Tariff Board, I mean I merely say that because I feet sympathy with Mr.Fenerty in his situation. At the same time I am anxious as Commission Counsel to get on with the work which you have in front of you. It is important. It is a Royal Commission, and I presume within the limits that your Lordship has very properly laid down, it is here to listen to the complaint of everybody who has a grievance. The Lieutenant-Governor sends out his Commissioners, I presume, to hear everybody who has a grievance on this subject. There is that about it, perhaps. Mr. Fenerty is asking for an adjournment until the15th of January. I would like to cut that down to the very least, and I certainly

agree that he should instruct these people and get them to come here at the very earliest possible time, and I also agree with what Dr. Boatright was able to do in two full weeks, that the men that Mr. Fenerty has in mind will be able to do the same, perhaps a little better, because they will have the advantage of what has been covered. The transcript will be available to those men, but I presume you cannot go to a man, certainly I know Dr. Boatright has other engagements and wants to get away, although he can come back again, it is difficult to get these men to leave their work in Texas or wherever they are, to come here, and I just say that, while I am anxious to get on with the work, I am quite willing so far as I am concerned, to agree to Mr. Fenerty's plan, when he wishes to bring here the men that they think they should have.

MR. FENERTY: Might I say this, that I am not presuming to suggest to the Commission that there should be a complete adjournment. If there is any way that other evidence can be proceeded with, of course we recognize that all I am asking is that if, without impeding the work of the Commission, this evidence might be introduced then, if you could proceed with some other matter if that would be possible.

THE CHAIRMAN: I was just going to ask Mr. Frawley, are you prepared to go on immediately after the first of the year with the other phases of the Inquiry, providing we assent to the idea that it should be split. Of course, it is the desire of the Commission to dispose of this pipeline matter as a separate thing. Now is there

something else that we could do after the first of the year, are you ready to proceed with the rest of the Inquiry?

MR. FRAWLEY: If we leave the pipeline Inquiry until the first of the year.

THE CHAIRMAN: When we adjourn this time, whenever that may be, and we have heard all the witnesses presently available.

MR. FRAWLEY: Yes.

THE CHAIRMAN: And adjourn, would you be ready to go on after the first of the year?

MR. FRAWLEY: I had a discussion with Mr. Cottle about that, and he knows the work which the Imperial is doing in Toronto, and the kind of submission they are prepared to make here, and also the British American as well, and he frankly thinks, he tells me he thinks the earliest date that we can proceed with the larger part of the Inquiry would be about the 15th of January, which would be about ten days later than we now have in mind starting. Then, of course, the hope is that there will be no further interruptions after that at all.

THE CHAIRMAN: Mr. Fenerty, you have two witnesses, you say.

MR. FENERTY: Yes, my Lord.

THE CHAIRMAN: One of whom will be here the middle of next week, I presume to go to work on this matter.

MR. FENERTY: Yes, my Lord.

THE CHAIRMAN: Now he certainly ought to be ready long before the middle of January, whether your

international expert is or not?

MR. FENERTY: I may say as to that, that is so, but it goes both to the weight of the evidence and the evidence itself, and there would be an advantage to all concerned, to my friends as well, in the opportunity of consultation between those two men.

THE CHAIRMAN: Yes.

MR. FRAWLEY: Still we have the other difficulty of getting the accounting evidence in, that also presents difficulties.

THE CHAIRMAN: Yes, but as you say, Mr. Fenerty, what you are proposing first, and I think perhaps you had better communicate with your people again, those who speak with authority about the attendance of these witnesses, because nearly all of the witnesses who are tobe heard have been heard with regard to the life of the field, the subject which has been engaging our attention for some days now. There is then, the evidence of the accountants, they are yet to follow. It is throwing the whole Inquiry out for the convenience of one person who may be interested in that it affects his financial interest and which one should not put lightly aside. Insofar as it is germane to this Inquiry, we want to hear you.

MR. FENERTY: I appreciate that.

THE CHAIRMAN: It is throwing everything back. I suggest to you, Mr. Fenerty, you now, being alive to the difficulties which present themselves to an extended adjournment, that you further communi-

cate and find out precisely what you can do. If you have a man coming here next week, he will certainly be ready long before the 15th of January. Now, there is benefit in consultation certainly, but if he is a man of the ability that you suggest, no doubt he will be able to speak for himself after the examination by himself, and we might get along with that witness which might occupy considerable time, by the time he is through being cross-examined. In short, we want to meet your desire to call your evidence and we want to give you time if possible.

MR. FENERTY: Frankly what we had hoped....

THE CHAIRMAN: But we do not just propose to keep meeting for a day or a day or two and then adjourning these meetings, when a person asks us to for a month or so.

MR. FENERTY: I have had the opportunity of discussing these matters we are now speaking of, but our hope was that the Commission could finds its way clear to give us that indulgence without too greatly upsetting the work of the Commission, that we could have sufficient time to present this evidence, not only to enable one of these gentlemen to complete his investigations, which you will see will be conducted in advance of the other, but to have the other one to come and complete his investigation, and that they should have an opportunity of comparing their results and considering the matter, and perhaps one modifying the views of the other, and the result might be of more value so far as all are concerned. Of course, if the Commission feels that it cannot

be delayed that long, we will have to present such evidence as we can have available at that time, whenever the Commission may say that that evidence will be received, and if the other evidence can be obtained in time, to bring it in, we will endeavour to do so.

THE CHAIRMAN: Now you say that one witness will be here next week?

MR. FENERTY: Yes, my Lord.

THE CHAIRMAN: The middle of the week. When can the other witness be here, and if it is essential that he be here at all.

MR. FENERTY: My information is that we cannot procure that particular witness in attendance until immediately after the New Year, due to othe engagements. Now we can, perhaps, look about for someone else, but the experts we have in mind we are anxious to bring them here, and it was for that reason that I suggested this adjournment to allow them to have ten days' to two weeks' investigation. Now that is the situation, but I can only leave it with the Commission.

MR. FRAWLEY: I think some attention should be paid to the fact that the men who are now coming will be certainly able to do this work in a much shorter time. Dr. Boatright had to prepare a lot of figures himself.

THE CHAIRMAN: The others will have the benefit of all that.

MR. FRAWLEY: Yes. They can have everything available that we have covered.

MR. NOLAN: So far as we are concerned.

everything which we have available we will be very glas to make it available to them also.

MR. FRAWLEY: I imagine it is all filed now.

MR. NOLAN: Or anything else they want from us.

THE CHAIRMAN: Mr. Fenerty, it is our conclusion that, giving every consideration to all that you have said, that this Commission should not be required to adjourn after it rises on the conclusion of the evidence of the witnesses now being heard, that we should not be asked to adjourn beyond the 9th day of January next, and on that day we propose to proceed and you will govern yourselves accordingly.

MR. FENERTY: Thank you.

(The Investigation was here adjourned, to be resumed at 2 P.M.)

.....

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THE CHAIRMAN: I perhaps should say to you that we have had, so that there may be no misunderstanding about it and no doubt throughout this Inquiry, will continue to have consultations with Commission Counsel.

MR. NOLAN: Oh certainly.

THE CHAIRMAN: As to the outline of the work and how it shall be proceeded with. We do not want anyone here to get the impression that we are taking one side and behind the back of others, consulting one side and not the other.

MR. NOLAN: No, my Lord, we understand that perfectly well.

Q DR. BOATRIGHT: Mr. Davies, as we finished this morning, I believe we were discussing the displacement, the actual formation displacement which had occurred in the Davies No. 2 well?

A Yes.

Q And I believe that we had arrived at a figure of approximately 60,000 barrels per acre foot under the assumptions which we made in that derivation?

A That is right.

Q Now I would like you to make that same calculation for the estimate which you have made of the average recovery per acre, which is given on Page 18 in your report, you show there 6,555 barrels of crude oil, is that correct?

A That is correct.

Q You also show 43-2/10 ths million cubic feet of natural gas?

A That is correct.

Q Now have you worked out what you consider the original average bottom hole pressure of area "A"?

A Yes, the very original?

Q The very original of area "A"?

A Yes. That was done by Dr. Link.

Q Have you that figure?

A No, we have not, as an average figure. I worked out the average at the date of commencement of each producing well. Dr. Link worked out the bottom hole pressure of July, June 1936, I presume that would be the one you want.

Q We have a pretty fair way of getting it, do we not, by taking the average contour line which splits your area "A" in the middle,and then calculating that on the basis of 36 pounds to the 100 feet?

A Providing this leakage or drainage is taken into consideration.

Q Yes, I realize that?

A Yes, we can work it out that way, that would be 17 from 26 would be.....

Q Let us see, your area "A" included.....

A From 1700 to 2600.

Q From 17 to 26, that would be, that would be approximately 2100 feet would it not?

A Yes.

Q That would be below sea level and if we add to that 4000 feet, it will give us 6100 feet?

A Times 36.

Q Multiplying that by 36?

A 2200 pounds, 2196.

Q Now this figure is the recovery per acre is it not?

A Yes.

Q And as I understand it you figured your recovery down to zero pounds rather than down to 300, am I correct?

A Correct.

Q Therefore, if we divide the figure which you have there by two, that will then represent the average pressure during which this recovery will be obtained, will it not?

A It will be 10, it will be a little over 1100 pounds, roughly.

Q And how many atmospheres is that? Approximately seventy?

A Approximately seventy.

Q Then if we divide 43.2 million by 70, we would get the cubic feet?

A That would be roughly 600,000.

Q Now if we divide that by 5.6, that will then give us the barrels at the average pressure?

A Well now there roughly 100,000 barrels, it would be 60 divided by 5.

Q Now that figure that you have just arrived at there, what does that represent?

A Well the figure of 600,000 is the number of cubic feet, 43,000,000 feet would occupy underground.

Q At average pressure conditions?

A At average pressure conditions.

Q And if we divide that figure by 5.6, then that will give us the barrels of space would it not?

A Per acre.

Q Per acre occupied?

A That is right.

Q Occupied by that gas at the average pressure?

A That is right.

Q However, in this particular case under the original sub-surface conditions, that gas really was not under that average bottom hole pressure, that is as original conditions were, it was actually under the pressure which occurred there originally which you have taken as, what was the figure you figured for the bottom hole pressure, you calculated it there?

A 2100, 2200.

Q At 2200 pounds?

A That is right.

Q So strictly speaking then, we should double that in order to arrive at the original sub-surface condition, should we not?

A You have gone a little too fast for me here. See if I follow you, if I have got it right, we are dealing with one acre and there were 600 cubic feet of gas per acre, is that right?

Q Pardon me, you have given the wrong, 600,000 was it not?

A 600,000, quite right, 600,000 cubic feet.

Q Of gas?

A Of gas in one acre at 1100 pounds pressure.

Q That is right?

A Now if we make that 2200 pounds pressure it would be ba half of that would it not?

A No, it would be twice as much, that is the actual space would only be half that much, half that much, that is what I think, 300,000, is that right?

Q That is right. Now then if we divide 300,000 then by 5.6 that will then give us the barrels of space will it not?

A That should be fifty.

Q That is right?

A Roughly.

Q Now then, in other words, if we add to that now the barrels of oil, what does that give you as a total figure.

A 56,555.

Q That again checks up fairly closely with the figure of the 60,000 we arrived at before and the 62,000 figure that I gave in my testimony on this?

A That is right.

Q Now I wish to call your attention to the map which you presented with your report and which shows areas "A" and "B", do you have a copy of that map?

A Yes, I have.

Q Now as I understand it this map represents your two areas which show only the South end of the Turner Valley field?

A That is right.

Q I wish to call your attention to several wells which I believe were omitted and which are at the present time producing; starting at the top of the map and just to the left of the corner between Sections 5 and 6 I wish to call your attention to the fact that there is an Anglo-Canadian Number 1 well, that well is not shown on the map is it?

A It is at the corner of Section 1.

Q Yes, that would be in the North East corner of Section 31?

A That is right.

Q That well was not shown on this map was it?

A It is not included in area "B", no.

Q And that well was completed at the time this map was made, was it not?

A Well we have not included any wells that we have not a thirty day record of.

Q I see. Now in going on to the right, in Section 32, and just South of the middle of that Section, due South of Royalite Number 30, we have West Turner Valley No. 3, which is also not shown on this map?

A Of which we did not have a month's production on.

Q Going on further to the South, in Section 29, just one location South of the North line of section 29, in about the middle of the section, there is the Command well, which was completed and which you did not include?

A But no record of it.

Q Continuing on South in Section 20 and just South of the Consolidated well, is Producers Crude No. 1 which is also completed, and which youdid not consider?

A No, it has been completed in the last few days, as a matter of fact, they are testing today I think.

Q Now in Section 17, one location South of the North line, in practically the middle of the section is Extension Number 1, that well has been completed fairly recently too, has it not?

DR. LINK: They have not got to the top of the limestone.

Q DR. BOATRIGHT: In other words, there are one, two, three, four wells in that area which you have not shown because of the fact that you do not have thirty days' production on them, is that right?

A That is right. There are some more drilling in that area close to the lime, in area "A", do you want to mention those?

Q No, I just wanted to point that out.

A In 34.

Q You also did not include the Home well in your estimate?

A No, that is another without a record of production.

Q I believe that during your testimony you made mention, in your earlier testimony, I believe you stated that there was something like a century's gas production yet to be taken from the field, is that correct?

A Of course that depends upon saving the gas.

Q At the present rate of consumption?

A About 6,000,000 feet a year.

Q In that event then you estimate roughly that there is about 600,000,000,000 cubic feet of gas, is that correct?

A Left in the total area. I did not make that actually detailed, I wonder if you still want that detailed gas estimate, of the gas?

Q Yes, I would like to have that, and as I understand it that will be brought up after January 9th, as to the exact figure. My estimate, you will remember I believe, was 450,000,000,000, so there is not such a large discrepancy?

A While we are on that subject I believe in reports submitted that we were concerned in 1931 with the reserves down to 400 pounds, which will make some difference as we are now taking them to zero.

Q With reference to the costs of wells in the gas area, I would like to read to you a statement made by Mr.

Spencer before the Select Standing Committee on Banking and Commerce before the House of Commons in 1932.

THE CHAIRMAN: Why?

DR. BOATRIGHT: It has reference to the costs of wells in the Turner Valley field, in the gas cap.

THE CHAIRMAN: What do you say, Mr. Nolan?

MR. NOLAN: Well my Lord, we are not conducting this investigation, I know, according to the strict rules of evidence, so that a good deal of latitude has been allowed, as there must be in order to get the information, but I am always disturbed when a statement of somebody given on another occasion is put to a witness, who was neither there nor knows anything about it, and I do not think it adds very much to the information which the Commission is seeking, to obtain, because as I understand it now Mr. Davies has agreed to go out and find what the average cost of drilling all wells in the Turner Valley is. The estimate that has been put in is only those wells which were called wells in the crude area. We intend to extend that estimate to the wells in the gas area, which I think the evidence has shown cost less in some instances. Now if we get the figure of what the actual cost was, that must be the best figure and the most useful figure for the Commission.

THE CHAIRMAN: It does not appear whom Mr. Spencer is.

DR. BOATRIGHT: No.

THE CHAIRMAN: If he were an expert andgave an opinion as an expert, the witness might be asked if

he agreed with that opinion, if he didn't that would be the end of the matter.

MR. FRAWLEY: That is right, that is what I was thinking of.

THE CHAIRMAN: But what someone stated in the House of Commons, what a well costs.....

MR. FRAWLEY: As a matter of fact what I was instructed that Dr. Boatright was going to bring to the attention of the witness was the evidence of the Chief Geologist of the Oil Company. Perhaps we might straighten out our facts and see if Dr. Hopkins was talking. I was just going to say this, even if it were not, what do you think about this estimate, say to the witness that, and perhaps it would not have any more value than that. If he says I think it was a good figure, and then does it matter whether it was taken out of a textbook or where it comes from.

THE CHAIRMAN: If it is a matter of opinion. If it a matter of a man stating a fact, that the wells cost so much, then he should be here to swear to it.

MR. FRAWLEY: Yes, and we must not try to put in indirectly what Mr. Spencer's evidence was, but just to ask this witness what he thinks about such a person's estimate, whether he agrees or disagrees, but in any event perhaps we should not pursue that, as your Lordship says. If it is Dr. Hopkins, he is the Chief Geologist.

MR. NOLAN: Mr. Chairman, are we not going to get the exact figures?

MR. FRAWLEY: If Dr. Hopkins said something then, and unless there are qualifications to be super-

imposed by this witness, it would be of assistance to the Commission.

MR. NOLAN: When did he say it?

MR. FRAWLEY: He was called before this Committee in 1931.

MR. NOLAN: That is a very very long time ago.

MR. FRAWLEY: It will be then so qualified.

MR. NOLAN: What assistance them is it to a Commission sitting in December 1938, when we are going to bring to the Commission the exact figures. If the whole thing was being left in the air, then I think estimates of all these gentlemen might be of value.

MR. FRAWLEY: May we do it this way, Mr. Chairman, we will submit the evidence and we will await your ruling, whether it is to be actually answered. It is the actual figure of 36 wells actually drilled at that time that Dr. Hopkins was submitting at that time, and actually drilled by this Company r presented here.

THE CHAIRMAN: Well put your question and we will rule on it.

MR. FRAWLEY: All right, Dr. Boatright.

THE CHAIRMAN: And don't answer until you are told.

Q DR. BOATRIGHT: This question was asked by Mr. Spencer of Mr. Hopkins, whom I believe is your Chief Geologist, "What is the average depth you go in the Turner Valley? A. The depth varies from about 3700

to 6000 feet. The average cost of 36 wells which I have in front of me here, no, the total cost of the 36 wells in the Turner Valley was $7,632,797.77, or an average of $212,166.00 per well."

MR. FRAWLEY: And to be complete somebody else asked a question, but that is Dr. Hopkins' complete answer.

THE CHAIRMAN: The first question is, does the witness know if Dr. Hopkins did make that statement on that occasion?

WITNESS: No, my Lord.

MR. FRAWLEY: Certainly if that is the ruling that that must be the first queestion, then he does not know because all we have here is a transcript of the evidence.

THE CHAIRMAN: All right. Then you propose next, I suppose, to put a suppositious question to him?

MR. FRAWLEY: Yes.

THE CHAIRMAN: "If he made that statement is it correct?".

MR. FRAWLEY: Yes, what do you think about it?

THE CHAIRMAN: If he did.

MR. FRAWLEY: If Dr. Hopkins did.

THE CHAIRMAN: And unless it is established that he did it is of no value. I think it not in any way objectionable to put it to him if Dr. Hopkins made that statement, if you would say it was an accurate statement.

Q DR. BOATRIGHT: If Dr. Hopkins made that statement as just read to you, would you say that statement would have been accurate?

A I would say that anything that Dr. Hopkins said would be

accurate.

Q THE CHAIRMAN: That is not the point?

A Yes.

Q In your opinion?

A I do not know where he got his information. In the report which I have just put in I gave 9 wells, on this 1931 hearing, and I see that the average cost of those works out at $173,000.00; now that is quite different to $212,000.00 and I want to be clear to answer what I am supposed to answer, my Lord.

MR. NOLAN: I think, Mr. Chairman, Mr. Davies does not quite understand what he is being asked, whether he has confidence in what Dr. Hopkins may have said on another occasion, that was not the point I do not think. The point was, has Mr. Davies any knowledge of what the first 36 wells drilled in the Valley cost.

WITNESS: No.

THE CHAIRMAN: That is a fact, I think it cannot be used for any further purpose.

MR. FRAWLEY: Of course there is a limit here to what I am attempting to prove, and I have not asked Mr. Nolan to bring here Dr. Hopkins, which would be my privilege to do, but it is perhaps of importance what the Imperial Oil admits about this.

THE CHAIRMAN: It might be of interest to us to show that it is in a record of the proceedings before a certain Board, and to file that as such.

MR. FRAWLEY: Yes, and as a matter of fact....

THE CHairman: We are not attempting to keep

you to strict rules of evidence in an Inquiry of this character, but I do think this, that it is wrong to attempt to get Dr. Hopkins' statements on the record, as distinguished from the witness' opinion of his statements, without calling him.

MR. FRAWLEY: Well now, of course, it is my responsibility. I am not throwing out anything for any improper purpose at all, it may be that if I had had any appreciation at all of what the Royalite Oil Company was going to present to this Commission on this occasion, I might have had Dr. Hopkins here to be cross-examined on what he said in 1933, but nevertheless, I will, I think I will file and perhaps under the rules, this being a document printed, prepared and published by the King's Printer at Ottawa, it may speak for itself, and your Commission may then read what was said. I think it is important to see what the Imperial Oil Company said when something else was under inquiry, quite, something quite different, namely the cost of producing gasoline, as distinguished from the thing inquired into today, which is the cost of carrying a barrel of crude oil from Turner Valley, I mean from what was said then, I am suggesting to the witness that is what he said and he said whatever Dr. Hopkins said would be true.

Are we to understand then, witness, that you are not prepared to challenge the figure, contradict or depart from the estimate which was made at the time, he was speaking from some prepared record in front of him, that the average cost of producing wells at that time was $212,266.00?

A I do not know, Mr. Frawley. I really do not know whether

that is correct. I do know if Dr. Hopkins makes a statement and he has a statement in front of him, I would say that was correct.

Q Then his experience seems to have been $212,000.00 as the average cost of 36 wells?

MR. NOLAN: Of course that is a back door method to do what the Chairman does not want done.

MR. FRAWLEY: I do not know where this is going, perhaps we will have to have Dr, Hopkins here, I do not know.

THE CHAIRMAN: I would think Mr. Nolan, in a Commission of this character, that reports of proceedings before a Committee of the House of Commons might perhaps be received for what they are worth.

MR. NOLAN: Oh yes, certainly.

THE CHAIRMAN: But to put in Dr. Hopkins' evidence through a witness who does not know whether he gave it or not, or whether it is correct or not,

MR. FRAWLEY: Perhaps Mr. Nolan had better get the record.

THE CHAIRMAN: I think that is going too far.

MR. FRAWLEY: Perhaps Mr. Nolan had better get the record which Dr, Hopkins had in front of him in Ottawa, they keep all these things, he had better get it.

. NOLAN: I do not want any differences, my Lord. I agree to anything in these proceedings, we are only here to assist, I am here by the permission of this Commission. I take it I have no right to be here otherwise than by the grace of the Commission, and I am willing to assist in the future as I have in the

past, in any way that I may. I am not objecting and have not objected to a great deal of evidence which your Lordship would not permit in a Court of law, because we go beyond the Rules of Evidence in an effort to get useful information.

THE CHAIRMAN: Quite so.

MR. NOLAN: But may I say again, Sir, we are going to get the cost of drilling these wells for the Commission Counsel. We have agreed through Mr. Davies to do that. Surely that will satisfy Mr. Frawley, and Dr. Boatright.

MR. FRAWLEY: That is very good then, Mr. Nolan, and will you be good enoughto do this further, will you check up the statement which was made then and see if that was a correct statement. Perhaps get the records, they will still be there, that were used to get this information.

THE CHAirman: Mr. Frawley, as I understand it, desires not only that you get the cost of all wells, but he confronts you with some evidence given by a superior officer in proceedings before a Committee of the House of Commons. He must first surely establish that Dr. Hopkins did speak before the House of Commons, he must show that the document that he seeks to have us take notice of is a document properly proven or shown to be gotten out by the King's Printer, and within the ordinary rules of reception. Now that all being done establishes nothing more than that on some other occasion Dr. Hopkins said something which may be true or false, and which, if he were called and given the opportunity to explain, he might at this time

quite explain, but while we do not approve of attempting to show that Dr. Hopkins said something by reading from a book to the witness, who knows nothing about it, we do not think that is proper, but we will receive the record of what transpired before the committee of the House of Commons if you think any importance attaches to it.

MR.NOLAN: And if I do nothing to contradict that it stands uncontradicted on the record, and the Committee will govern itself accordingly.

THE CHAIRMAN: We had better leave it that way.

MR. FRAwley: With that last statement which my learned friend makes that if he does nothing to contradict the statement then the Commission reads the report for what it is worth and it is worth 100% then.

THE CHAIRMAN: We will, of course, then attach such weight to it as we think fit.

MR. FRAWLEY: Coupled with my friend's statement that if he does not deny it.

THE CHAIRMAN: All right then, we will proceed Doctor. Just a moment, Major Lipsett suggests when you are making that statement of actual costs it might be of interest to have these 36 wells which have been referred to in this report, Mr. Nolan, segregated if you can.

MR. NOLAN: I think as a matter of practical convenience, is it possible to ascertain what those 36 wells were, the first 36, that is the thing which was bothering me?

MR. FRAWLEY: I will solve that, I will telegraph to Mr. Le Sueur tonight and ask him to send us the very 36 wells.

MR. NOLAN: You do not need to telegraph to him.

MR. FRAWLEY: He does not mind if I telegraph him.

MR. NOLAN: May I remind you that he is out of your jurisdiction?

MR. FRAWLEY: I am quite certain he does not mind me asking.

THE CHAIRMAN: There should be no difficulty about it. Mr. Nolan has said he will get those costs, and you will also segregate those 36 if you can.

MR. NOLAN: I was just going to ask, can that be done, if we have the names of the wells?

MR. FRAWLEY: Your Company will have them.

MR. NOLAN: We will do our best, Sir, to ascertain for this Commission the names and numbers of the first 36 wells drilled, and the average cost per well.

MR. FRAWLEY: No, just the 36 wells he was talking about on Page 332 of the Report, because he just says "36 wells of Turner Valley". He must mean there the 36 wells drilled.

MR. NOLAN: It couldn't be wells after that. It would mean wells before. We will do the best we can to get that.

THE CHAIRMAN: All right, Dr. Boatright.

DR. BOATRIGHT: May I ask a question?

THE CHAIRMAN; Yes.

DR. BOATRIGHT: What I have in mind here is simply to break down the cost figures in thegas area and to show the probable return under reasonable assumptions. I realize, of course, Mr. Davies is going to get the exact figures at a later date. However, as I understood it the Commission was interested in having as many facts before it at the present time for consideration during this interim, as possible.

THE CHAIRMAN: Quite so.

DR. BOATRIGHT: And my idea in this cross-examination was to develop a reasonable basis for showing what the estimates which have been submitted by Mr. Davies would lead us to insofar as return on investment is concerned.

THE CHAIRMAN: You are perfectly free to put any suppositious case to Mr. Davies that you see fit, he is here as an expert witness, but I am objecting at the moment to your putting to him that Dr. Hopkins said this or said that, because I do not know that that is so, and, therefore, your basis for the assertion may be unfounded, but you can put a suppositious case to him as much as youlike, and it matters not w ether Dr, Hopkins said it or any ody else said it, the question is if this was said, is it true, which is another way of saying to him "On these facts is something true"?

Q DR. BOATRIGHT: Mr. Davies, under the assumption that the average cost of a well in the Turner Valley field is $165,000.00, and considering only the oil area, I believe I am correct in stating that only 64 wells have been drilled to date in the oil area?

A I think I made it 70.

Q All right, we will take the figure of 70, and I believe that in your testimony you showed that there were approximately 17 additions, wells that would be necessary to drill out what you considered proven acreage?

A I do not think I gave the number of wells, but I gave 666 acres, and you named some of the wells yourself, Anglo-Canadian has been drilled, or in process of finishing, and that was one of them, and on the basis of one well to 40 acres, that would be, may I just figure that?

Q Surely?

A It would be 16 wells I think about.

Q 16½ would it not?

A Yes, say 17 wells. You cannot have half a well.

Q Then, if there were 70 wells already drilled in that area and 17 additional wells drilled, that would make a total of 87 wells in the oil area, would it not?

A That makes a total of 87.

Q And that $165,000.00 per well?

A Do you want me to multiply it?

Q Yes, if you will?

A $14,350,000.00 I think.

Q That does not check with the figure I have?

A To be sure I am right, I think that is right.

Q I believe it is $14,355,000.00. Now if we assume that the operating costs of each one of these wells will be $1000.00 a month for the next five years,

A That is 60,000 times 87.

Q That is right?

A $6,000,000.00.

Q That will be the additional cost to lift that well, will it not?

A That is right.

Q And if we assume that these wells will require $10,000.00 worth of surface equipment after completion, that will add how much?

A $870,000.00.

Q Now then, if we add to that the additional cost for lifting, under the assumption that two-thirds of the oil will be lifted by natural flow and one-third by pump flow, and assuming that the total of 26,000,000 barrels will be produced over the next five years?

A That would be one-third of the lift cost on each.

Q There will be two-thirds of 26,000,000 barrels at 10 cents a barrel?

A It would be 17,200,000 barrels at 10 cents.

Q At 10 cents?

A That would be $1,720,000.00.

Q Yes, that is right, and assuming that the other one-third will be produced at a lift cost of 50 cents a barrel?

A That will be $4,300,000.00.

Q Then that will give the approximate outlay in obtaining these 26,000,000 barrels over the five year period?

A Yes, $27,265,000.00, is that right?

Q All right. Now that 26,0000000 barrels, let us assume that the royalty amounts to 25%?

A It will leave 19,500,000.

Q Now that 25% figure which I gave I believe corresponds with your estimate of about what the average royalty in the field is, is that correct?

A I said of a great number of wells, but in that South end a great number of them have 25% on them.

Q Then what was the figure?

A 19,500,000 barrels.

Q Then that leaves 19,500,000 barrels of oil to pay these operating costs, does it not?

A And the drilling costs.

Q Now if we assume a price of $1.20 a barrel for that oil?

A $23,400,000.00.

Q That is right. Now that would be the total revenue to be expected from this proven oil area upon the basis of this estimate which you have made of the oil that that area contains, would it not?

A That is right.

Q The total cost under the assumptions which I have made would be what?

A $27,265,000.00.

Q In other words about a four million dollar loss would accrue?

A That is about right.

Q On Page 17 in your report, in the first paragraph, the following statement is made.

> "The discovery of another shallow oil field, the cost of drilling is less than
> "$165,000.00 per well, would effectively and
> "suddenly end development in Turner Valley,
> "as operators could not compete with lower
> "cost oil",

it is possible that during the next twelve years a new oil field will be discovered in Alberta?

A Yes.

Q Is that correct, that statement comes from your report?

A Oh yes, I agree with the statement.

Q As a matter of fact are there not shallow oil fields scattered all over the United States which produce at depths varying from a few hundred feet to three or four thousand feet, and at the same time fields producing from as deep as 13,000 feet?

A That is true.

Q At a profit.

A That is true. At least you are asking me something, at a profit, that is something I do not know of my own knowledge.

Q As a matter of fact they are producing?

A They are producing, I will agree with that.

Q And you will also agree, will you, that the cost of drilling a well does not necessarily determine the price which is paid for the oil from that well?

A No, no.

Q And you will also agree I believe, that if you can produce Turner Valley crude at $1.20 a barrel now, without another oil field, which is of shallower depth being in, you can still produce at $1.20 a barrel, were there another oil field in?

A Providing that we could make money at $1.20 in Turner Valley. That goes first.

Q Yes?

A If it were going to cost more to get this oil out, than we were going to get out of it, then the development of Turner Valley is going to end.

Q You can get $1.20 a barrel and still operate?

A Yes, but the development is slowing down quite materially.

Q Nevertheless you can operate at $1.20 a barrel?

A Yes.

Q In other words the cost of drilling is not a true criterion of whether a field will be operated?

A Well it is with some companies, to distinguish here between a purely development company such as the Imperial Oil Company and a stock promotion affair, which the price of oil or the amount of oil does not enter into at all, and we are just reaching the stage of development in Turner Valley of being very much concerned about how many dollars do we get back on the average from drilling crude wells.

Q Let me put my question in another way, you will admit, will you not, that at the present time the Turner Valley field is being developed and is being produced with the price of oil at $1.20?

A That is right.

Q And if in the event of a new shallow field being discovered, it would have no effect upon that condition unless it resulted in Turner Valley crude being reduced to a point less than $1.20, some point less?

A That is if the price was reduced, if the price structure was reduced.

Q That is right?

A And we will say offhand that if the field west of Innisfail turns out to be a shallow oil field, at 1500 feet, and that they could afford to produce oil and deliver it here for $1.00 a barrel.

Q Well, let me ask you this, is the price of oil set by what the Company can afford to do?

A Now you are getting into the great question of price, are you not?

Q I admit that, but this paragraph to which I am referring also gets into the great question of price?

A I gave it as my opinion if we get shallow oil fields here, that the Turner Valley development will not be carried on.

Q But you will admit, nevertheless, in that event the price is the thing which would determine whether or not that will occur?

A That determines the whole development question, is it profitable or not.

Q And the question of whether it is profitable or not will depend upon what the price structure is at that future date?

A That is one of the factors.

Q And the price structure is not necessarily set by the cost of drilling a well?

A No.

Q As a matter of fact under present conditions the Royalite or Imperial has four wells drilling, at the present time in Turner Valley?

A Yes, they have four rigs running.

Q Now going down to the bottom of that page, you have a statement on what rea you refer to again;

"As has been pointed out previously, natural gas "disposal is a serious problem".

May I ask you to explain that statement?

A Well, we have the question of this Conservation Board and none of us are aware of the steps which are necessary to take to produce a well or at what stage the disposal

of natural gas becomes a factor and you stop producing them. These wells change and they are continually changing, and the basis of estimate which you are making can be, absolutely will come to an end. If they say "All right, tomorrow you shut your well in", then all the calculations which you have made go.

Q Are you or are you not familiar with repressuring and pressure maintenance?

A We have given it a good deal of consideration.

Q You have had experience in doing that in this field?

A No, the only thing we have any knowledge of in this country at all, is what public work has been given to this Bow Island field.

Q All of your statements concerning restoration and pressure maintenance then, are based on what knowledge you have obtained by reading about those subjects, and not from actual experience with these operations?

A If you be r in mind, I distinguished between pressure maintenance and defined it as such and re-pressuring. You are correct in connection with your remarks referring to re-pressuring.

Q What about pressure maintenance?

A I feel most of the work we have done is as to how we can maintain this decline in Turner Valley. In the particular type of formation we have in Turner Valley, cannot possibly be equalled anywhere, the amount of detailed attention we have given to that problem.

Q Have you put any gas back in Turner Valley?

A It was tried in one of the upper formations some years ago, and, I think that is correct.

Q And it has never been done?

A No.

Q Then so far as either pressure maintenance or pressure restoration is concerned, your opinions which have been stated are merely based upon your interpretation of what you have read.

A If you will allow me to distinguish between re-pressuring and pressure maintenance.

Q All right?

A I define in the report what I mean by pressure maintenance, was to maintain the pressure now in the formation and to lower the rate of decline by every possible means, that I defined as "pressure maintenance". If you mean something else now.....

Q No, what I am trying to find out is this,

A I will admit I have no experience in Turner Valley on the re-pressuring of Turner Valley, none of us here have, no one has Dr. Boatright.

Q And what you mean by "pressure maintenance" does not involve any actual compressing gas and putting it back into the ground?

A No.

Q Yours has been merely pressure maintenance by virtue of controlled wells?

A That is right.

Q That is what you have in mind?

A That is what we have in mind.

Q "Pressure maintenance" is generally considered as involving re-pressuring to maintain pressure, which is all you can hope to do here, unless you have some outside source of gas which you can bring in and pour

back and gradually put up the reserve.

A You are defining it in a little different way from the way we use it in Turner Valley.

Q But so far as any repressuring operations, you have not had any experience with that?

A No, none of us have.

Q Your only experience has been with an attempt to maintain pressures?

A That is it.

Q By proper control?

A That is right.

Q And where you make any statements then concerning pressure maintenance, you are referring.....

A To the way I define it.

Q To the control of pressures?

A To the way I defined it in here, and I defined it very carefully.

Q I am trying to get it clear on the record, that is all?

A All right.

Q You see that is not the ordinary definition of the word, and it is not the way it is understood in the States, although that is not necessarily a criterion, so I want to get it clear on the record?

A All right.

Q The pressure maintenance to which you refer in here has to do only with the efficient operation of wells in order to conserve the pressure in the formation?

A That is right.

Q As high as possible?

A Yes.

Q And has nothing to do with re-introduction of gas

which has once been produced?

A No.

(The Investigation was here adjourned for five minutes).

Q DR. BOATRIGHT: Mr. Davies, during your previous testimony I believe you made some statement about it being impossible to, or it being necessary that the gas be produced at an appreciable pressure in order to run it through the absorption plant, about what pressure would that be?

A Well there is one plant carrying 70 pounds and the rest are carrying 150.

Q As a matter of fact these absorption plants do operate about thirty pounds?

A Oh, it is a matter for the decision of the plant.

Q And even with the particular plant by slight changes in the plant they can make them operate at smaller pressures?

A The size of the gathering lines, they were designed a great number of the mains were designed on the 150 pound basis, and now they are too small and if they try to operate.....

Q It simply cuts down the volume of gas going to the plant if they lower the operating pressure, but still it is quite feasible?

A Yes, and I am not sure but what it is the proper thing to do. The recovery, I have a graph which I did not put in, but I will bring to your attention now, showing the difference in recovery of a number of crude wells at the separator pressure, at various pressures, and it changes the amount of gasoline recovered so materially,

perhaps it would be of value to the Commission, my Lord.

(Witness produces same).

My Lord, this is a graph showing an experiment which was conducted on two wells, Royalite Number 32 and Consolidated Number 1, both of those wells are in the area "B" and it shows the difference in the amount of recovery, operating at 150 pounds the recovery from the, gasoline that is left in the gas after the separator is 2.2, while carrying a pressure down to 25 pounds the recovery is .6 in one case and .65 in the other case. I think this should be put in.

DR. BOATRIGHT: I think that would be a good idea.

GRAPH PRODUCED BY WITNESS HERE MARKED AS EXHIBIT "22".

Q DR. BOATRIGHT: That brings up a very interesting thing in connection with these reserve figures, your actual production figures which have been used, the actual production from the well then depends upon the separator pressure at which that well is operated, doesn't it?

A That is the natural gasoline production, it does.

Q Well the product which produces it in that separator is commonly called naptha, is it not?

A I was referring, this is referring to crude wells, it would be crude oil dropping out in the separator.

Q But that crude oil consists of the 40 to 60 gravity crude plus some naphtha which is contained in the gas base and drops out?

A That is right.

Q And the gasoline which remains, that goes to the

gasoline plant, is a thing which you find amounts to about three times as much in one case as in the other?

A That is right.

Q In other words the crude figures which are shown here for the production of crude oil depends thus upon the separator pressure?

A That is another factor.

Q Which obtained at the time that particular well is operating?

A That is another factor.

Q And of course you have no way of knowing the various pressures at which these wells have operated throughout their lives?

A Well we have a complete record of all the wells operated and controlled by the Royalite.

Q But not all of the wells?

A Well I will tell you, I am around the field practically every day or every other day, and I know the operating pressures of pretty nearly every well. There are a few such as the Anglo-Canadian, I do not know.

Q You know these pressures fluctuate up and down at the whim of the operators?

A That is right.

Q And throughout the life of the field these separators have not operated at equal pressures, even on a given well?

A That is so.

Q Let alone on the whole field?

A That is right.

Q So these figures which were given for crude are not exact

figures are they?

A They are barrels of oil that went into the tank, there is no question about that.

Q But they are not really true criteria of the actual amount of crude oil which was passed compared with the vapour phase product which was knocked down to the separator?

A That will be correct.

Q That curve which you brought in will illustrate that very clearly?

A Yes.

Q So it is very clear that the vapour phase product which is contained in that well, in a particular well at least, is constant, is it not, the whole vapour phase product?

A That it will be constant all the time?

Q Yes?

A Now that gets into a question of whether the gravity of the oil rises over a period of time or lowers doesn't it?

Q Well to a certain extent.

A And we get into this question that as a well gets older and the gas travels from a further distance back, what fractions travel with it. Now so far we have had some increase in gravity as wells get older, and I brought that point out.

Q Gravity of what?

A Of the crude, and in that gravity of the crude will be reflected operation pressures of the separator again.

Q That is right?

A So then we have the factor which I mentioned in previous

13254.27
3623.14
16877.41

testimony about, while you might have a high gravity of the crude in the storage tanks, and sell it, yet that might be less before you get it into the refinery?

Q But the curve very nicely illustrates the point that these crude figures are not exactly right? ?

A Yes.

Q When the vapour phase passes through the system?

A Quite right.

Q Now I do not believe that you calculated, calculated on Dr. Link's probable productive acreage amounting to 17,187 acres, the total recovery that might be expected, even if we admit your figure of 6,555 barrels per acre?

A No, I didn't.

Q Is that right?

A That is right.

Q That calculation does not involve a great deal of trouble and I wonder if we might do that, it simply involves multiplying the figure 17,187 times your figure 6,555?

A You are including in there the area already developed, 3,933, are you not?

Q Yes, I am including everything, that would give us then the total probable recovery reserve based on your own estimate of what those recoverable reserves are per acre?

A That is 112,438,785.

Q Yes, and at the rate of 5½ million barrels demand a year, that would have how many years' production?

Q THE CHAIRMAN: Just wait a minute until I get these figures, what are the other figures?

A 112,438,785. This 5½ business we will have to take off what has been produced to date.

Q DR. BOWTRIGHT: That is what exactly, Mr. Davies?

A That would have been in the beginning of time, that basis of 17,187 acres, if there were recoverable 6,555 barrels in each acre, that would have been the total amount of oil which was there at the beginning, perhaps not there but recoverable from there.

Q And there have been approximately 7,000,000, let us hold it to the nearest million figures, because that is all it amounts to anyway, that would be 112,000,000 minus 7,000,000, would it not?

A Yes.

Q Or 105,000.000 barrels altogether?

A 105,000,000 barrels, and then you calculate it at 5,000,000.....

Q 500,000, which would be slightly over 21 years, would it not?

A Quite, slightly under 21 years, it is slightly under 20 years, is it not, 5,500,000 divided in,

Q Yes, it is slightly under 20 years, you are using a slightly different figure from what I did?

A That is right.

Q Then if the 17,187 acres listed as possibleby Dr. Link are productive, then on the basis of your own figures you then show about 20 years potential production that is left in the field, is that about right?

A Taking all these assumptions, that is correct.

Q You have a mistake which I am sure is merely typographical in one of your figures on page 15, in the middle of the page, the third paragraph in the second line, on page 15 you say:

"Of this reserve 7,807,082 barrels has been "produced to October 31st, 1938".

Now in your Summary Sheet that figure is slightly different?

A 7,807,082, page 18?

Q 7,807,082 is the figure on page 15?

A Yes.

Q And let me see, I guess the only way we can check that figure is to add the two statements Number 5 together, I believe you will find there is a slight discrepancy there, it doesn't amount to much, just a few barrels?

A That is the figure, it should be right, it was checked by a number of people, 5,198,046 in area "A", and area "B" is 1,915,754, to which we have to add this Advance and Model in the North end. I can take it right out of the record. Of course, that is the only way to do. I will have to go a little slower. I have a sheet here with it on, I am sorry, my Lord.

THE CHAIRMAN: That is quite all right.

WITNESS: I think I will have to take it out of the record because I cannot find mine.

Q DR. BOWTRIGHT: I will tell you, it might be quite all right for you to check that figure, it is just a clerical error I am sure, but it does not amount to anything. I couldn't check the figure so I thought it might be possibly a mistake, I may have overlooked taking something in?

A It would probably be the production in the North end.

Q It would save a little time if you would do that?

A All right.

Q I was merely calling it to your attention to have it

corrected. In your estimates of recoverable oil you, of course, have based your arguments upon the past operating conditions?

A That is right.

Q And they have been very inefficient, to say the least, have they not, in many wells?

A Yes, but not in all wells.

Q In the field as a whole the field has been operated inefficiently, the over-all production of the field has been inefficient?

A I am not going to agree with that.

Q Would you say the majority of the wells have or have not?

A I would agree with that.

Q The majority?

A It is about 50-50, 53% are operated to the best of my judgment quite properly.

Q Well as a matter of fact if any of the wells in the field were operated inefficiently then the field as a whole has been operated inefficiently, has it not?

A You are stating it that way.

Q And your estimate is about 50-50, which would make about half of them operating under very bad conditions?

A That is it.

Q And the other half operating under fairly good conditions?

A That is so.

Q Then in the event that the true pro-ration is put in the Turner Valley field, your estimates would be appreciably increased, would they not, of ultimate recovery?

A That is just a matter of opinion. I am afraid we are not

going to agree on what proper pro-ration is, because I am not impressed with the efforts so far.

Q We will call it true pro-ration, no matter how it is obtained, but in that event you would expect to enlarge your figures quite materially?

A Cannot you call it proper operation, you used the word pro-ration.

Q That is satisfactory if you like?

A Yes. Pro-ration here, we have got into the idea of dividing up the barrels of oil.

Q Then I will re-word the question, in the event that the individual wells in the field as a whole are operated more efficiently in the future than they have been in the past, then in that event your estimate would be considerably increased, would it not?

A It would be increased, that is correct, but I want to add something to this, 112, the answer in regard to this 112,000,000 barrels, and that is that I put in my report that to develop that area would require a capital sum of $57,000,000.00 something, which goes along with the recovery of the oil.

Q That is right?

A Perhaps I had better get the number of wells.

Q I think that will not be necessary unless you particularly wish to reiterate it?

A I wish to bring it to your attention, my Lord, that while these 112,000,000 is under consideration, along with that consideration is the capital cost to drill the number of wells in order to get it.

Q As a matter of fact if the assumptions which were made in our calculations today are correct, that is what they

have been doing during the whole development of Turner Valley is it not? Remember I said if the assumptions I made are correct in our calculations today, that is exactly what the whole, it is exactly the way in which the whole of Turner Valley has been developed, is that not right?

A That is they have been losing money.

Q Yes?

A I am inclined to think that that is true, on the whole, money has been lost.

Q Referring to your statement Number 4 on page 50.....

Q THE CHAIRMAN: Do you say that applies to wells operated efficiently?

A No, my Lord, I do not think that that, that might not take place. Now your question is that would the development of wells operated efficiently in Turner Valley, did I get your question right, that is a question I cannot answer because, just let me think a while now, oh, I think on wells operated efficiently you can make money on the average. We have made money on drilling wells in the gas area, operating the well efficiently. Whether or not on the average there is going to be enough oil recovered in the crude area is a thing that we have not got clear, we have not got quite long enough lifetime yet, to be certain about. It is a matter which is concerning us all very materially right now, what is going to be this recovery in fact per acre, and we are just not long enough lifetime to say whether or not we are going to make money or not, right now, but in the gas area, considering the sale of gas along with other revenue, you can operate wells and

make money. For instance a little concern I am connected with, we have made money. It has been efficiently done, in my judgment, and we have made money, but over the whole I still agree that, over the gas area, that a great deal of money has been lost. Now I am not going to speak for the Royalite. They can speak for themselves.

Q DR. BOATRIGHT: As a general rule is it not true that engineers are inclined to be conservative?

A Well Dr. Boatright, I will say some of them are.

Q But in the over-all average, in order to protect themselves, they generally are, are they not?

A I will tell you, Doctor, what I feel is if you were in our place and you had been here and had all this information at your disposal, you would probably have looked at the whole problem in a much different viewpoint to what you do, and maybe in our viewpoint.

Q I do not have to agree with that?

A No.

MR. FRAWLEY: You don't have to necessarily agree with that.

WITNESS: You asked me about the question.

Q DR. BOATRIGHT: I asked you the question, is it true that all engineers are conservative?

A Yes.

Q And are you ready to admit that the ordinary lifetime of an oil field as estimated by the engineers is always very conservative, and is almost invariably raised during the lifetime of that field?

A There again, that may be true now, it may be necessary a year from now to raise this figure of 6,555 barrels.

Q In other words, you are not at all sure that that productive area, that possible productive area that Dr. Link has forecast, may not be productive area, are you, you would not want to go on record of saying that is not going to be productive are you?

A No, and I am not going on record ond, saying it is either. I am sticking to the fact that you must drill wells to find out. This money thing which bothers me more than anything else, where do you get the money to drill these wells.

Q There are four Royalite wells drilling now, are there not?

A That is right.

Q MR. NOLAN: Out of now many?

A I will have to count them, but I would say it is about 20%.

Q DR. BOATRIGHT: That is a fair number of drilling wells for a Company, is it not, 20%?

A Well the people who have the money to drill wells are, of course, the Royalite.

Q But people who have money are not notoriously liberal with it as a general rule, if they don't think they are going to get their money back?

A You have in this country, with all of this, with the whole thing before you, we have in Canada one oil field and the evidence before this Commission goes broadcast from one ocean to the other, and an estimate made here which may be a wild guess and incorrect, goes broadcast, and everybody thinks "Well all you have to do is drill a well and you get 15,000 barrels an acre",

well that is not true, and that is why we want to be so careful in putting before the public only those facts that we are sure of or that we can stick with, that we know are true. Now we get to the question, the Royalite have money, they are only about 20%.....

Q THE CHAIRMAN: I suppose you would equally not want to depress them too much?

A Not the slightest, just the straight facts as we know them, my Lord.

Q DR. BOATRIGHTE These figures also have a bearing on the pipeline rates, and its life?

A It has a tremendous bearing, but you have to drill the wells before you can put the oil through the pipeline.

THE CHAIRMAN: Well I think we will proceed in the morning.

(The Inquiry was here adjourned, to be resumed Friday, December 16th).

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